The

Electrical Review

VOL. CIII. OCTOBER 19, 1928. No. 2,656.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.Inst.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 8871 (5 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
Progress in the Domestic Field	633
Electric Fire Design	634
Electric Cooking	634
The Woman's Part in Domestic Electrification	634
Gas on Trains	635
Apprenticeship in the Electrical Industry	635
"A Fit of the Blues"	635
Selling Electricity, by Lt.-Col. W. A. Vignoles	636
Quality and Service, by W. H. Walton	637
Electricity in the Household, by G. Z. de Ferranti (*illus.*)	639
Electric Light in Modern Homes, by W. J. Jones (*illus.*)	641
Heat Loss from Thermal Storage Tanks, by M. Fishenden (*illus.*)	644
Refrigeration and the Electricity Supply Industry, by L. R. Morshead (*illus.*)	647
The Wiring of New Houses, by Mrs. Wilfrid Ashley (*illus.*)	649
The Demonstration of Electric Cookers, by A. Mole (*illus.*)	650
Electrical Advance in Australia, by Lt.-Gen. Sir J. Monash (*illus.*)	651
Domestic Electrical Progress in Melbourne, by W. H. Alabaster	654
Electric Fires (*illus.*)	657
Electric Cooking (*illus.*)	662
Electric Water Heating (*illus.*)	666
Electric Lighting Fittings (*illus.*)	668
Other Domestic Appliances (*illus.*)	670
Electricity in Canadian Homes, by A. S. L. Barnes	673
Electrical Progress in New Zealand, by F. T. M. Kissel (*illus.*)	675
Domestic Electric Developments in Durban, S.A., by E. Poole (*illus.*)	678
Correspondence—	
Replacement of Apparatus on Changing-over	679
Insulating Oils	679
Business and Industrial Notes	680
Lighting and Power Notes	684
Tramway and Railway Notes	686
Telegraph and Telephone Notes	686
Radio Notes	686
Contract Information	687
Forthcoming Events	688
Notes	689
Our Personal Column	691
Financial Section—	
New Companies Registered	692
Official Returns of Electrical Companies	692
City Notes	693
Stocks and Shares	694
Published Specifications	695
Trade Mark Applications	695
New Work for Contractors	696

Progress in the Domestic Field.

IN this issue of the ELECTRICAL REVIEW we place before readers our third annual survey of developments that are taking place in the domestic department of the electrical industry and trade.

It will be observed from the above list of Contents that we have again been favoured with contributions from the pens of authors of distinction in this country and in the British Dominions, dealing with various aspects of the progress that is being made practically everywhere in these days in applying electricity to meet the needs of the household.

It is not possible in these introductory notes to deal at length with these valuable contributions; each possesses its own peculiar merit, and we believe that those who read the whole will feel that they have attended a useful course of domestic electrical education or instruction. We wish, however, to direct attention to three features of this present effort: first, the progress of the woman's movement in our sphere of life is recognised by the inclusion of more articles by ladies of eminence who have kindly come to our aid; second, we have thought fit to devote a larger amount of space to what is happening in certain parts of the British Empire outside the British Isles; and third, the issue is larger than the Domestic Electrification numbers of 1926 and 1927, partly because of the progress of the business and partly because domestic activity becomes increasingly possible as we proceed with large electrical development works in all parts of the world. We centre much of our thought on the brilliant future that lies before electricity here at Home, but we cannot lose sight of the scope in Britain beyond the seas; and we must not forget, while interested in these fields, that every year the opportunity abroad will grow as markets such as China, Russia, and South America get into their proper electrical stride and become electrical buyers on a large

scale. British enterprise is not only required for putting down big plants; it is essential for our manufacturers and traders to be active also in meeting the requirements of household consumers of all nationalities.

We hope that the material that we have collected will both furnish the reader with a useful summary of the situation as regards the rate at which business in domestic electricity supply is developing, and provide all classes of buyers with particulars of products that our manufacturers and traders are prepared to supply; also that the great volume of information that expert contributors have placed at our disposal in one single issue will itself be a means of accelerating the rate of progress in the safe and sound utilisation of electricity for every class of service in which it can make life cleaner, purer, less burdensome, and therefore altogether happier and more contented.

Electric Fire Design.

One of the articles in this issue contains illustrations and notes on a few of the electric fires which the many manufacturers are putting forward for the 1928-29 season. As these form only a small proportion of the models available, it will be realised that the choice is bewildering. Each has its points in the directions of efficiency, utility, beauty of design or cheapness, and all tastes and pockets are provided for. With many catalogues available, the public has every facility in choosing the fires it wants. The dealer's task is not so easy; he cannot possibly stock samples of all the myriad designs. It is our hope that the article will afford him some assistance in deciding which fires to put on show.

In response, no doubt, to the public demand, there seems to be a marked increase in the number of imitation-coal fires. These are very popular, for the tradition of the blazing hearth will persist for a generation or two and must be satisfied. The allied design—the glowing reflector type—also comes in increasing numbers and in a variety of pleasing models. Another development which has made progress is the screen type of fire in which a reflector bowl is mounted in an art metal surround. This provides a useful alternative to the removal of the fire-grate to make room for an electric fire.

On the whole, prices appear to be lower this season. There is no better form of propaganda than a reduction of prices, and we hope to see the movement continue without detriment to the manufacturers. This, combined with lower energy rates, will bring the all-electric idea into the home at an accelerated pace.

Electric Cooking.

Progress in any electricity supply service demands a reasonable measure of stability in connection with the necessary consumers' equipment. That this stage has been reached in respect of electric cookers is now beyond doubt. It is true that the old question of the enclosed *versus* the open type of boiling plate is still unsettled, and probably will remain so for a long time, but manufacturers seem to have arrived at the point of "agreeing to differ." There certainly seems to be something to be said for each kind of plate, and perhaps the solution of the problem is a combination of the two types of apparatus, either in the form of a semi-protected plate, or by fitting both sorts of plate separately on the same cooker. In an article in this issue, Mr. W. H. Alabaster, city electrical engineer, Melbourne, referring to the position in Australia, says that there is no doubt whatever that in his area the open-type boiling plate will soon be completely replaced by the enclosed pattern. But whatever the means adopted to "get round" the problem, the fact remains that the electric cooker is now a thoroughly reliable and efficient apparatus, and when an electric kettle is included as part of the outfit, the combination can be used with the utmost confidence in the competition of domestic electricity with other services.

Electricity supply authorities should now sacrifice their personal predilections, install what has been proved to be sound, and get on with the business of selling their own commodity. That there is a big demand by the public for electric cooking is evidenced by reports from many progressive centres in this country. At Wimbledon, for instance, we are informed that cookers are being installed in a steady stream by the supply undertaking with comparatively little selling effort on the part of the staff. Abroad, too, the demand is equally great in many parts, as is made clear by articles elsewhere in this issue and by outside reports

It has often been urged that the first step in the making of an electric cooking consumer is to sell her an electric kettle—the cooker will come along automatically. On the other hand, there is an opening for a small quick-service cooker, specially designed with suitably placed elements, and essentially cheap, which could be used as a supplementary appliance to the normal domestic cooker. Little thought only is needed to convince one of the many uses to which such a small cooker could be put, particularly for "warming-up" purposes, and of the economies that could be effected thereby. Such an apparatus might, we suggest, be used as the initial selling step with more effect, perhaps, than an electric kettle.

The Woman's Part in Domestic Electrification.

It has often been said that the place for woman is the home; the truth of that saying has been seriously questioned in recent years by the effective incursion of women into fields that were supposed to be exclusively masculine preserves, but in one respect at least it remains unshaken and is even fortified—namely, in connection with "domestic electrification," which is the dominant feature of this special issue. We count ourselves fortunate, therefore, in having obtained the assistance of women, each an authority on her subject, as contributors of articles on the application of electricity to domestic purposes.

The Electrical Association for Women, which under the able guidance of Miss C. Haslett as director and secretary has made such remarkable progress during the past four years, has recently embarked upon a campaign with the object of developing the "other uses" of electricity in the home—those uses which, even more than that of lighting, lessen the labour of housekeeping and add to the comfort of the home. It is singular that whilst electric lighting is being universally adopted, though gas lighting is a very good alternative, the many other functions in the home which electricity is so admirably adapted to fulfil, and for many of which it is the one and only agency, are frequently neglected; to remedy this oversight, the E.A.W. has prepared a model specification, to which attention is directed elsewhere in this issue by Mrs. Wilfrid Ashley, president of the Association.

On the other hand, the delights of a fully-equipped electric home, and the right way to ensure their enjoyment, are explained by Mrs. Z. de Ferranti in an article equally notable for its originality and for its human feeling, whilst it is based upon that best of all foundations—personal experience, extending over many years. Dr. Margaret Fishenden, whose authority on the subject of heating the home is equalled only by her strict impartiality, deals with a matter which we regard as of rapidly growing importance—the electrical storage of heat in water, the essence of which is the adequate and efficient heat insulation of the storage tanks and piping; and Mrs. Annie Mole, who possesses an experience of electric cooking almost unrivalled in duration and scope, puts her finger on a point of vital importance in the sale of electrical cooking apparatus. We have no doubt that readers of these articles will be impressed with the efficiency and importance of the part played by women in the electrification of the home.

Gas on Trains.

Once more we have to record a heart-breaking disaster, accompanied by the most horrifying circumstances—a collision between a fast passenger train and two goods trains under a railway bridge, building up a mass of wreckage which was ignited by gas and blazed up like a furnace. The wretched victims, roused from sleep by the shock and unable to escape from such an inferno—where rescue was utterly impossible—perished in agony, and their bodies were so completely destroyed by fire that identification was in most cases impossible.

Time and again in past years we have called attention to the danger incurred by carrying cylinders of compressed gas on railway trains, and have urged that steps should be taken to put an end to this practice. As the London and North-Eastern Railway has demonstrated, not only the lighting, but also the cooking, can be effectually performed with electricity, with the minimum of risk, and there is technically no excuse for the use of gas, which was abolished years ago on the French railways. In many respects our railways have led the world in point of safety—in this one particular they lag behind. The Board of Trade inspectors have emphasised the risk and have recommended a change to electricity, and much progress has been made in that direction, but this latest holocaust indicates that even on an express mail train of the L.M.S. system gas was still in use. Looking at the matter on the lowest ground, the large sums that the company will have to pay in compensation would have gone far towards providing electrical equipment for many expresses.

Apprenticeship in the Electrical Industry.

An interesting scheme of apprenticeship for the electrical industry was recently drafted, after mature deliberation, by the Association of Supervising Electrical Engineers, and submitted to the leading electrical bodies for their consideration; an outline of its terms appears on p. 638 of this issue. The scheme is not confined to any one branch of the electrical industries, but is framed with a view to its application to all branches, and for that reason its management is proposed to be undertaken by a Central Apprenticeship Board composed of representatives of the various interests affected, to which Board the boys are to be indentured; this plan will enable every boy to be transferred from one branch to another for stated periods, so that his five years' training will be carried out on broad lines and at its conclusion he will not be a mere wireman or mechanic, but a fully trained electrical artisan; his technical training is to be concurrent with his workshop training, a plan which is generally recognised as highly efficient and beneficial.

That the systematic training of apprentices, and a steady flow of trained men into the industry, are urgently needed has long been recognised; some of our leading manufacturing firms have admirable schemes in operation, and much attention has been given to the subject by such bodies as the B.E.A.M.A. and the E.C.A. But hitherto such schemes have aimed at supplying the needs of particular branches of industry, or of individual concerns, and the scheme now published is the first, we believe, devised to apply broadly to the whole of the electrical industry. Presumably it would aspire to absorb or supplement the existing schemes rather than to supersede them. A precedent for the central idea may be found in the "joint apprenticeship committee system" which is in vogue in certain cities in the United States, and which similarly provides for the education and manual training of apprentices; this system was outlined in the *Ministry of Labour Gazette* for August, 1928, and it is stated that long waiting lists of applicants for apprenticeship indicate that there is no want of interest on the part of the boys.

Owing to the lack of systematic training under present conditions, it is feared that in 10 or 15 years' time there will be a serious shortage of men qualified by training and experience to fill responsible positions, and one purpose of the A.S.E.E. scheme is to avert this danger; another is to endow the rising generation with skill and ability in their vocations.

We understand that the Executive of the Association, without wishing to encroach on the preserves of the older associations of employers and workers, believes that by virtue of its intimate contact with both parties, its absolutely neutral position between them, and its exceptional opportunities of observing the needs of the case and the difficulties met with by boys of the apprentice class, it is peculiarly well situated to propound a scheme of training common to all branches of the industry and to bring the matter under discussion on the broadest possible lines. The scheme, of course, is put forward merely as an outline, subject to whatever modification may be thought desirable by the interested bodies. Without at this stage discussing the merits of the scheme, we feel that the objects of the Association are highly commendable, and that the proposal is worthy of the serious consideration of the industry for whose benefit this laborious task has been voluntarily undertaken.

"A Fit of the Blues."

We have had a rude awakening right in the middle of a most enjoyable dream, in the course of which we were being entertained at a feast of the whole electrical industry, all of us gluttons in the consumption of electricity or veritably intoxicated with orders for electrical products of British manufacture. And we awake to what?—to a statement issued to the Press by the Economic and Statistical Section of the B.E.A.M.A. telling the public to be less excited about this industry because in actual fact it is no better off than all the others that are in a parlous condition. We will fall asleep again and, like the aforesaid Section, enjoy a veritable nightmare: all the fond hopes that have been raised as we have heard of busy factories, well-filled order books, and good times in store for everybody, have been dashed to the ground; even the B.E.A.M.A.'s own words published here on June 8th, which told of enormous deficiency of generating plant in position and a coming glut of orders which it would be impossible to cope with, are eaten by the Section, for it has all proved to be wrong, because the consumption of electricity in certain industrial areas, as ascertained by the Section, has not been increasing during the past glorious summer at the rate upon which its optimistic forecasts issued only four months earlier were based. As this is a special number in which we have devoted nearly all of our space to telling only a tithe of the fascinating story of progress that is taking place more and more rapidly in the field of domestic electrification, we have not room to dwell in detail upon this depressing statement. We refer to it briefly in our "Business Notices." All we can say now is that we do not like the way in which words seem to have been chosen to belittle the value of substantial business that has been secured, and to show that the electrical industry both on its supply and manufacturing sides is not in a position "markedly different from that of the other basic industries of the country," and that the course of events in certain industries has become rapidly worse since March, neutralising the B.E.A.M.A.'s own optimistic prophecies made at the beginning of the year, "especially with reference to a boom in power production." We are not, of course, wishing to give the impression that the Sectional statement now issued is all wrong, but the whole thing leaves such a disagreeable flavour as to make one wonder whether it could not have been differently worded, especially as it is such a "let down" after "the most optimistic" Survey issued by the B.E.A.M.A. when "the electricity supply industry was entering upon its first great period of revival" (Elec. Rev., June 8th, p. 976).

The life in the industry will prevent it from being plunged into gloom, and will likewise, we hope, prevent electrical investments from becoming unpopular with the public, and it must not be supposed that political policy dictates the necessity for trumpeting it abroad that the industry is not in so promising a position as it was said to be a few months ago.

Selling Electricity.

A Huge Commercial Business demanding Modern Methods.

By LT.-COL. W. A. VIGNOLES, D.S.O.,
Director of the British Electrical Development Association.

IN a certain city in Great Britain in the financial year 1922-1923 the number of units sold by the electricity undertaking for domestic heating and cooking purposes amounted to 1.8 millions. Five years later sales had increased to 10.2 millions per annum, or more than five times the first figure.

Let us pause for a minute and consider what these figures mean. The undertaking in question was established before the end of the last century, and in 1923, after about 25 years' work, had built up what appeared to be a substantial business in the sale of electricity. In the five succeeding years, however, some change evidently took place either in the tastes of the public, or in the selling organisation of the undertaking, or in both, as in each of those five years the average additional business secured was equal to the whole of the business secured by the work of the previous quarter of a century. The average rate of progress had been multiplied by 25.

The sale of these units has not only involved the supply of the electricity itself, but also the supply of wiring installations, cables, plugs, switches and other accessories, together with the consuming devices such as lamps, radiators, kettles, cookers, and water heaters, without which the electricity could not have been used.

What has happened in this town is happening elsewhere, and the increase in the rate of progress that can be obtained in the development of the use of electricity for domestic purposes is only limited by the amount of work and energy put into the selling organisation, by the extent of the propaganda, and the policy of the council, or company, as regards tariffs and the laying of additional distributing mains.

The increase in output secured in most towns, large as it often is, is still only a fraction of what is likely to be obtained in the future.

Mr. Geoffrey Porter, the engineer at Worthing, has shown in his contribution to the discussion on the papers read at this year's I.M.E.A. Convention, that if half the consumers at present connected to the mains at Worthing used electricity for room and water heating, and for cooking, the total sales of his undertaking would be increased from 4 million to 23 million units per annum.

Such an increase in output can only be secured if the consumer is supplied with the necessary installations and apparatus, and it is, therefore, to the advantage of both the supply undertakings and the contractors to work hand in hand in the endeavour to increase this class of load.

The increase in the sale of electricity for all purposes, with its consequent increase in the sale of all electrical materials, apparatus and plant, is the main object of the Association with which the writer is connected, and the principal objection raised by undertakings, and others, against co-operating with the Association is that they are already so busy that they have no time to devote to propaganda work.

The acceptance of this attitude indicates a point of view which, the writer feels sure, has never been adopted by the big successful commercial undertakings. It is one which should be rejected by the electrical industry, if we recognise, as we must all do, that the selling of electricity, and the apparatus connected with it, is a huge commercial business, the various sections of which are interlinked very closely, and that modern methods should be applied to this business to the greatest possible extent.

Rapid development cannot be expected in districts where the price is above the economic level, that is, above the figure at which it would pay the consumer to use electricity for any particular purpose, but already there are a very large number of towns where the price is below this level; figures in possession of the writer show that for a small house using electricity for all purposes, where, say, 5,000 units per annum is consumed, the average price (including the first charge in a two-part tariff) would be below 1½d. per unit in 187 undertakings in this country, while in about 150 of these undertakings the running charge per unit would be ¾d. or less. In these areas, which comprise most of the principal towns, no complaint can be made on the score of price.

Business during the summer months has not been too brisk, and we must probably look forward to a slack period in the demand for electrical apparatus every summer, especially if it should be, as this year has been, fine and warm. With the help of "Summer time" people are undoubtedly living out of doors in the summer months more than they did, less cooking appears to be done, and people are less interested during that time in the inside of their houses.

With the putting back of the clock, and the coming of dark evenings, the position becomes entirely changed, and the public once more consider their comfort in the home.

Mr. Ll. B. Atkinson pointed out, at a meeting at which he spoke some months ago, that there are constant changes in the direction in which people spend their money, and that during the present century a large amount of the money that was at one time spent in the public-house, or at least in the purchase of alcohol, has of recent years been directed to buying motor-cars and motor-cycles. He visualised, however, that with the growth of motor traffic on the road, which has undoubtedly reduced the pleasures of joy-riding, the proportion of money so spent has probably reached its maximum, and that in the future the continual increase in the spending power of the nation will be devoted largely to the home with a view to making it a more comfortable place to live in.

It seems probable in this connection that special attention will be devoted to labour-saving devices and that, even if the cost is greater, people will spend money in order that they may have the comforts they require with the least trouble to themselves and the members of their household.

With the continual growth in the desire for healthy conditions, more and more people will wish to use electricity instead of gas, as an ever-increasing number will refuse to put up with the unpleasantness caused by the products of combustion discharged into their rooms by gas burners, or stoves.

In this connection it must be remembered that while a number of gas stoves are fitted with flues, there are considerable practical difficulties in fitting one to a gas cooker.

Probably the chief obstacle to-day to more rapid electrification is the rented house, as it is the experience of many of us that whenever a man buys a house he somehow or other finds the money to install electricity, at least for lighting purposes. This difficulty is being overcome to some extent by the introduction of assisted wiring schemes, which are in operation in at least 150 undertakings.

When the would-be consumer first comes into con-

tact with the supply undertaking, or the contractor, an opportunity occurs of suggesting to him the use of electricity for purposes other than lighting; this opportunity should always be taken, and the desirability of putting in a considerable number of outlets should be impressed upon him.

In this connection general propaganda work is of great value, as the consumer is more likely to accept the suggestion put to him if he has previously thought of using electricity for heating or some other purpose. Continuous educational propaganda towards the public is one of the greatest needs of the industry.

The development of the domestic load, and by this the writer means the increase in the number of consumers as well as the increase in the number of units purchased by existing consumers, will continue, but the rate of progress can be increased by good organisation and hard work on the part of those concerned, especially by the team work that can be put in by E.D.A. Circles combined with the steady issue of suitable propaganda.

The work will be hard, but the reward will be great. The public is ready for the development, but however much a commodity may be required, it cannot be sold without effort. I appeal, then, to everyone connected with the electrical industry to consider the present position, and to see what they can do this autumn and winter to assist in the development of this business to the advantage of themselves and everyone connected with the industry.

Quality and Service.

A "Council of the Industry"?

By WALTER HENRY WALTON,
President, The Electrical Contractors' Association (Incorporated.)

HOW to bring the advantages of a comprehensive electrical service within reach of all householders, in the best possible way and in the shortest possible time is, I take it, one of the main themes of the "Domestic Electrification" issue of the Electrical Review; and, since we are talking "among ourselves," rather than to the public at large, I feel called upon to deal with some of those basic trading considerations that must be taken into account if we are to achieve success in an educational and practical movement of such gigantic dimensions.

I certainly do not wish to put the brake on, much less to oppose, electrical progress in any useful direction, but I do most seriously suggest that we must build our domestic service structure upon the soundest possible and most dependable foundations. In addition to this, let us be certain that the trade scheme of communication in the background is thoroughly well-organised to support the development work that is being carried on in our front lines with such conspicuous energy.

In this connection, as it seems to me, one of our basic difficulties is to be found in the lack of cohesion and understanding observable between the several main sections of the industry we are all attempting to serve. We have the manufacturers, the supply engineers, the contractors, and other groups, each more or less banded together to achieve their own security and ordered progress; but the absence of any directive mind or "central urge" capable of bringing those groups into useful contact seems to be only too apparent.

One of the best services that any man could render the industry at the present juncture would be to provide a sound, workable scheme with this end in view. Several tentative suggestions in this direction have, of course, already been made, but whether the more spectacular among them are capable of practical application is certainly open to debate. Mr. T. R. Martin has advocated the appointment of a High Court Judge at £10,000 a year, while Mr. Marryat has suggested a joint committee of the industry as a "preliminary but unavoidable evil." Personally, I incline with a greater sense of satisfaction to the latter alternative, and I would suggest that the initial call to such a joint conference on business fundamentals should be voiced by some outstanding electrical and financial figure, such as Sir Hugo Hirst. As Mr. Martin has said, all sections of the industry assert their anxiety to "do the right thing." Let them be given the opportunity, therefore, to do it—to reduce their theories to practice, and in the most direct and straightforward manner that we can possibly devise.

Beyond question, the point stressed above will have to be tackled if the electrical industry, in the immense future that lies before it, is to give the best possible square deal to the public and secure a reasonably square deal for itself.

In this matter I have no hesitation whatever in giving the consumer priority. Without the consumer the industry cannot possibly flourish. But electrical service, no matter in what sphere, is worthy of adequate reward. It is not such a poor proposition that it must be Dutch-auctioned to the lowest bidder. Over-anxiety for "development" sometimes prompts this policy, but I am convinced that it is fundamentally wrong. If, year in and year out, we have to depend upon any form of daily service, then that service must be sound, dependable and free from irritating troubles. Inconvenience, the risk of accident, fuss and worry, tinkering and breakdowns—these things will do more damage to useful electrical development than we dare to contemplate. And this dependable, trouble-free service will never be secured so long as we worship at the shrine of the lowest tender—so long as we search for the cheapest possible piece of tin-pot apparatus and applaud the cheapest possible example of inconvenient and slip-shod installation work.

It does good, I think, to call a brief halt at times and to inquire precisely where the prevailing winds or tides are taking us. Not for one moment would I cavil at an honest desire to bring the benefits of an electric service within reach of the humblest cottage. But when I see consumers of this type presented with an electric iron in order to obtain, in the slot-meter, some appreciable return on the capital invested in the installation, then I have the uneasy feeling that the whole scheme is not a sound one either from the point of view of the supplier or of the supplied.

Are we not inclined to take too modest, too lowly an outlook on electrical possibilities? When, a short time ago, we were moved to demonstrate that an electrical domestic service (actually electric lighting alone) was not the wildly extravagant thing that some of our commercial rivals attempted to suggest, we thought, naturally perhaps, that the best way to counter this propaganda was to put the so-called "service" into the smallest possible house. But when we look round at the tens of thousands of somewhat larger residences in possession of individuals living in fair comfort, in possession of those who *can* afford to purchase a new lamp when an old one has burned out, some of us are beginning to wonder whether we have not aimed rather too persistently at the outer edge of the public target.

In tens of thousands of fairly comfortable houses to-day electric lighting is the only service our supply stations are providing. It is becoming very apparent that the prosperity of the supply undertaking, the manufacturer or the contractor will never be greatly advanced until a determined attack has been made on lighting consumers from the standpoint of those "auxiliary uses," with which we are all so familiar.

The supply engineer must look in this direction for the necessary load to fill up those provoking valleys in his supply curve; the manufacturer may anticipate a demand for sound auxiliary apparatus that would warrant its production in economic quantities; while the contractor would be called upon to provide installations *of suitable capacity* to enable the public to enjoy a comprehensive electrical service, convenient and trouble-free, from one year's end to the other.

It seems to me that, in the past, we have concentrated rather too persistently on "lighting." I wonder why? Are we electrical men just a little half-hearted, a little afraid, of the "other uses"? In discussing them with our lay acquaintances, is our mental attitude absolutely assured, unqualified and unwavering? Given reasonable supply conditions—and what *are* "reasonable supply conditions"?—do we say at once, as a matter of ordinary routine, that "of course" and "undoubtedly" electric cooking and heating are no more expensive, and very much better, than other competitive systems? Or do we hesitate concerning the "other uses" because practical, every-day experience of them has not yet been gained by us?

The point may provoke a measure of individual heart-searching, but our feeling of complete assurance in the lighting field admits of no doubt. Recent E.D.A campaigns have been lighting efforts (doubtless because of E.L.M.A.'s ammunition in the background) but, from many points of view, the time appears to be overripe to develop *existing* consumers on other than purely lighting lines. The claim that lighting represents the thin end of the electrical wedge is true enough. *But the wedge needs driving home*: and—a point I want to emphasise—the wedge must be driven home in a secure and dependable manner, if it is not to slip out again with disastrous effect upon the public mind. Too many such wedges have slipped out already. Far too many members of the public have put bowl fires and other fairly heavy equipment on the lighting mains, at lighting rates, and have thereby obtained a wholly erroneous impression of the possibilities of a sensible electric service in the home.

The vast majority of the women to be approached in any campaign of electrical development, run their own homes single-handed, and they are notoriously impatient of domestic apparatus that is in any sense complex, inconveniently placed or liable to provoking breakdown. The brooms and brushes of the past still hold sway because with physical energy behind them, they are dependable, simple, and in a sense, trouble-free. Hence my prolonged insistence on the good, convenient and trouble-free electrical installation. By advocating anything short of that standard we are asking for very serious trouble indeed.

From this particular aspect of the problem I return in conclusion to the general theme of my opening paragraphs. The business troubles under which the industry labours at the present moment prompt many observers to call for "compulsory powers" to achieve this, that, or the other reform. Such compulsory reformers have my sympathetic regards, but I remain of the opinion that the less bureaucratic interference we have with business matters the better it will be for all concerned. In any case, there must be a way out of many of our difficulties without recourse to Acts of Parliament. I am convinced that such a joint conference as that referred to above would go a long way to formulate and stabilise general trading conditions within the electrical industry. It is impossible to ignore the fact that, if the principal members of the trade stood in line in connection with any particular policy, the "outsider" would find it extremely troublesome to sail against the general wind.

Meanwhile, each of us must plod ahead steadily in the right direction, and I believe that no competent observer will dispute the fact that the "will" to go in the right direction, the desire to do the fair and reasonable thing, is stronger (or, perhaps, I should say "better organised") within the electrical industry to-day than ever before. Valuable individual work is being carried out by all sections of the industry, and by electrical contractors, permit me to claim, as vigorously as any. In approaching an electrical age, for example, we must build up an adequate supply of trained and competent wiremen, and it is worthy of note that the apprentice-training scheme and awards of the Electrical Contractors' Association represent the only practical effort that has been made in connection with this vitally important matter. Organised electrical contractors are also attempting, with limited backing, to prevent the use of shoddy material and the execution of shoddy work. We certainly require minimum standard wiring rules—with adequate force behind them to make their evasion distinctly unprofitable.

In the light of my earlier remarks, however, the "force behind" such minimum requirements presents some little difficulty. But, as I see it, not an insurmountable difficulty. Is it to be imagined that existing electrical authorities would neglect to formulate suitable "orders" if the demand for them was expressed in unmistakable terms by a joint council of the industry, or that they would be unable to enforce them without the special aid of the State? If the nations of the earth can agree to put their own world house in order for the peaceful development of humanity, is it too much to expect a great and enlightened British industry to put its own trade residence in order, and to keep it so?

The A.S.E.E. Apprenticeship Scheme.

THE Association of Supervising Electrical Engineers recently issued to the leading electrical societies and institutions a "Suggested Scheme of Apprenticeship for the Electrical Industry," for their consideration. The intention of the scheme is to provide a steady supply of skilled men, and in the first instance it is designed to apply to boys who have to contribute to their own maintenance.

An essential feature of the scheme is that the boys will be indentured not to individual employers but to the electrical industry, as represented by a "Central Apprenticeship Board," which will consist of representatives of the various interests affected, with local committees to deal with local matters.

The boys at entry are to be between 15 and 17 years of age, and must have attained to an agreed standard of education. The duration of apprenticeship contemplated is five years, and the employer (a member of a recognised body of employers) is to undertake that every opportunity shall be given the apprentice to learn his craft, including time off for attendance at classes.

Three schedules are outlined respectively for the "Contracting Section," "Manufacturing Section," and "Supply Section" of the electrical industry, so arranged that whichever branch the apprentice enters, he shall receive training both in installation and in manufacturing work in suitable proportions, as well as in generation and distribution, and in drawing-office and commercial-office work. The cost of technical education is to be borne by the Central Apprenticeship Board, or possibly by the Government. Non-attendance at the classes involves deprivation of wages, but satisfactory progress is rewarded with a bonus. The Central Board is to be responsible for the management of the scheme, funds being provided by the organisations represented.

Electricity in the Household.

The modern electric home can be run with a quarter of the labour required by the ordinary old-fashioned house; but the user must be taught the best way to handle the appliances.

By GERTRUDE Z. DE FERRANTI.

I AM writing this article hoping it may interest people who have homes to run, and who, since the war, have found it a hard and difficult task, owing principally to scarcity of labour for the home; and still more am I concerned for those who have to do their own work in the home. During the war the domestic helps realised that practically every other job was easier than housework. I never realised myself, before the war, what housework was, until I, like many others, had (whilst our domestics took the pleasanter jobs in the factories) to carry on my home and practically do the work of four people.

This I had to do with coal, coke, lamps and candles, with brooms and floor mops. Doing this work taught me how terribly inefficient we were in the home, and what ridiculously hard and dirty work we expected our workers to do. It also decided me that as soon as the war ended, we must change our method and use electricity wherever it would save work. We should then require less labour, and I felt sure workers would be easier to get when work could be done in ways so much easier and cleaner, without much of the old drudgery.

Mrs. Z. de Ferranti.

We have now been using electricity on everything in the home for four years. The difference is enormous! Where we used to require five people to work for us, we now require three, and whereas the cost of washing done at a laundry was a heavy expense, it is now nearly all done at home without extra labour. I have had no difficulty whatever with the workers cooking with electricity. My experience is that owing to the heat being so simply regulated, it is far easier than to cook with an oven heated by coal. It stands to reason that anyone would rather cook with a clean stove, that merely requires a switch turning on, than have to keep fetching and carrying coal. I find that once they have used electricity for cooking, the workers never want to return to coal, and that the maids are not as wasteful in using it as they were in using coal. Many a time I had to complain in the afternoon of a roaring fire with dampers all left open and heat being wasted up the chimney, principally because they were afraid the water for the children's baths would not be hot, or the oven not hot enough to cook the dinner when it was wanted. It was far more difficult to teach them and get them to remember the right way to use the dampers, than it has been to teach them to regulate their oven and hot plates with electricity.

To be able to control the heat of the electric oven and to get any desired temperature as shown on the indicator, has been very much appreciated by my workers. They say that cooking with coal was all guess-work, and many a time food was spoilt in consequence. I find an ampere-meter showing the cook how much current she is using is also much appreciated, as it shows her at a glance what is the equivalent of the heat she is using for her cooking. It is also useful when switching on; if she sees that it does not register, evidently something is wrong with one of the heaters; also if it registers more than she expects, she

Fig. 1.—"Little Haldon": Rear View of House and Sunk Gardens.

Fig. 2.—Entrance Hall.

sees what she can turn off to use less current. I feel that it is most important, when all cooking is done electrically, that an ampere-meter should be used so that the cook can see what she is using, without necessarily understanding at all how it works. Then what a blessing it is that the maids are no longer responsible for the water-heating, with all the attendant trouble of carrying coal and keeping the fire in to do this. Heating water electrically is, or should be, entirely automatic, giving no trouble or care of any kind to those running the house. Using electricity for heating water enables the maid to get up half-an-hour later of a morning, she not being responsible for getting hot water ready for baths.

Fig 3.—"Little Haldon": The Drawing Room.

I have heard women say their cooks would not cook on an electric stove. This, I feel sure, is because they have not given them the chance, or they are not sufficiently interested and cannot be bothered to learn about it themselves. I have found that people who have cooked for me have taken to electric cooking with the greatest readiness, and I have seen how their health has improved, cooking in a kitchen that is healthy, in an atmosphere free from gas fumes and from the dirt and smoke of a coal fire.

Electricity makes the housemaid's work before breakfast very much lighter—there are no dirty grates to clean, no coals to fetch, and no fire to light—just to switch on the electric fire, and run over the carpets with the vacuum cleaner, or if it is a polished floor, the electric polisher; all nice clean work—how different from pre-war drudgery! I have been surprised to see how interested the maids are in their electrical appliances. Naturally, one has to teach them to use the various things correctly, and how to keep them clean and oiled.

I must now refer to a very important matter—the appliances that can be used in the house to save labour. The greater number of people cannot possibly afford to purchase all of these things. It seems to me essential that the electricity supply authorities should make a business of hiring-out all these appliances and maintaining them in good condition. Many gas companies loan out any appliances which will consume gas, and so increase their sales. They are also most prompt in attending to the wants of their consumers, and no trouble seems to be too great for them to help their customers. If it pays these very commercial concerns to do this sort of thing, surely it is the right course for electricity supply authorities to follow.

It is also necessary to teach the householder how to use these appliances, and how to keep them in order to ensure the best service. My experience in using various appliances has been that the user must be taught the proper way to keep them clean. Take the floor polisher, for example: I noticed, after mine had been used two or three weeks, that it was not doing its work properly, and instead of polishing, it left greasy lines on the oak floor. I found this was caused by too much polish having been put on the floor, so that the rotary brushes had got a hard sticky surface on them and no longer acted as polishers. We then had to clean the brushes with petrol, and the polisher again did its work properly. Result: we use much less polish, and see that the brushes are kept clean. No one selling me vacuum cleaners ever showed me the importance of the way the flexible should be wound on the hooks provided on the handle; the common way is to wind the flexible round and round the two hooks, but this kinks it so badly that it is soon worn out. Instead of doing this, it should be wound in "S" fashion round the hooks. This method avoids putting a twist into the flexible, which consequently lasts in good condition for a much longer period. It is simple things of this kind, which are so important, that people should be taught to do properly, when they first use an electrical appliance of any kind.

With regard to laundry work, *electricity has made this quite easy* for those who have to run a small house. The electric washing machine has taken all the hard, back-aching work out of washing, and the work to be done is now more mental than physical, and therefore more interesting. The electric drying cupboard and the electric ironer make one independent of weather in any house. In some small houses I have seen space devoted to coal storage which, when electricity is used, provides ample accommodation for the small machines required to do the washing work.

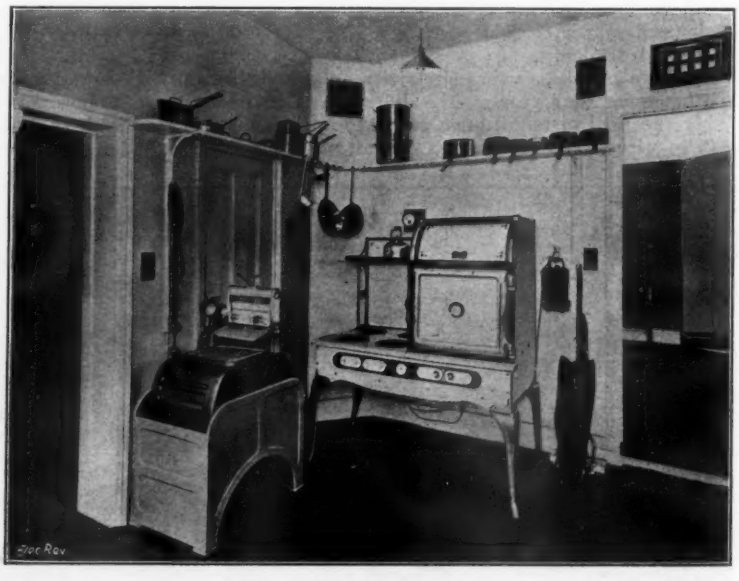


Fig. 4.—The Electric Kitchen.

A great saving of space in my seaside house results from the taking away of all fire-places and mantelshelves, which adds more floor room for furniture and

wall space for pictures. What a saving would be made in building costs if all houses were now built without chimneys and fire-places, and only small flues provided for ventilation! The saving thus effected would provide the necessary money for electrification.

Where an existing house has both a kitchen and a scullery it is often possible, when making it into an all-electric house, to turn the kitchen into a sitting-room, and the scullery into the new kitchen, as the space taken for an electric kitchen is so much less than was required on the old system. I have followed this method with great advantage in my house already referred to.

In conclusion, from my own practical experience, I know how much easier and healthier women's lives can be made by using electricity in their homes. Think of the married women with families living in small houses, who get little or no help in their homes, and not only *have* the children, but often do all the work of the house themselves. How they do it using coal . . . . it is nothing less than misery; no man would do it. I therefore feel that I should do everything I can to help the women to enjoy what I have—electricity in the home. To achieve this, we must first educate the supply authorities, then we must educate the women, and for this reason we should support the E.A.W., which is doing so much to help the homes of England—and it is time!

Fig. 5.—The Dining Room.

"Little Haldon."

In addition to their beautiful all-electric home at Baslow Hall, in Derbyshire, which was described in the Electrical Review of June 17th, 1927, Dr. and Mrs. de Ferranti have a seaside residence at Deganwy, "Little Haldon," which when they bought it was antiquated in many respects, involving a great deal of labour to keep it in satisfactory condition. Consequently it was decided to carry out extensive alterations and to convert it into an all-electric and hygienic house: larger windows fitted with "Vitaglass" were inserted; gas was replaced by electric light, and radiant-heat electric fires were substituted for coal fires; hot and cold water was laid on to all bedrooms; the bathroom was refurnished, and warmed with an electric fire fixed to the ceiling; a thermal storage tank was installed, together with electric cooking and washing appliances; electric carpet cleaners and floor polishers were provided; ultra-violet ray apparatus and a mains-operated radio-receiving set were installed. Cooking being relegated to the scullery, the old kitchen was converted into a sitting room, thus increasing the accommodation.

The result is that, not only is the house very much more comfortable to live in, but also the housework has been reduced to the minimum; one maid is able easily to keep the whole house in good order. It is stated that in a fully-equipped electric house the manual labour involved is reduced by nearly 75 per cent., without increased expense in other directions. Moreover, with the automatic thermal storage system advocated by Dr. Ferranti, comprising a large well-lagged tank with electric heating elements controlled by a thermostat, not only is the house provided with abundance of hot water for all purposes, but also the electricity supply authorities benefit by a most desirable load, for which they are usually able to offer specially low tariffs.

The illustrations which accompany Mrs. de Ferranti's article are reproduced from photographs of the exterior and interior of "Little Haldon."

Electric Light in Modern Homes.

Improvement in lighting practice has not kept pace with modern progress in the furnishing and decoration of the home.

By W. J. JONES,
Assistant Manager, Lighting Service Bureau.

THE 20th century has witnessed a great change in the domestic life of the community, in a large measure due to the formation of modern suburbs and garden cities. This change has been accelerated by the development of modern means of transport, and the extension of public services in general. As a result, a very much greater proportion of the public live in smaller houses, and in many instances own them. Simultaneously, there has been a simplification in the running of our homes, and the introduction of labour-saving devices. In all this, electricity has played no mean part, as witness the number of new electrical connections per annum, which approximately equals the number of houses built per annum. Everyone recognises that electric light is exceedingly convenient and efficient, and the modern home is considered incomplete unless electric light is available. Unfortunately, many homes of to-day are less than half lighted, according to the reasonable ideals and principles of the present time, largely because the owners have the impression that as they possess electric lighting it is of necessity 100 per cent. perfect, and, moreover, there is a tendency to look upon lighting as an expensive necessity.

Frequently, the brilliant clear gasfilled lamp is used unshaded, or in conjunction with glass shades which do not shield the filament from view, and the result is eye-discomfort due to glare, and a decidedly detrimental effect on the decorative charm of the room. Harsh shadows are inevitable companions of glare, and these, besides hindering vision, still further detract from the effect of a well-designed interior.

The ideal is achieved in electric lighting only when the lighting scheme is considered at the time the house is being designed, and it is unfortunate that in the majority of instances the subject of electric lighting receives but scant attention at the hands of the architect; particularly is this true in the new housing estates which are being everywhere completed. The omission is prevalent in both expensive and comparatively inexpensive types of property. For example,

not one house in a hundred is provided with the convenience of two-way switching, or when built is fitted with plug points in living rooms, while the provision of points for brackets is an almost unheard-of luxury. Only recently I had occasion to inspect a new house in Bishop's Avenue, Hampstead—property several thousand pounds in value. The only plug point available in the whole of the house was placed in the hall. One cannot conceive of any purchaser of such property being satisfied with only ceiling points for lighting, and hence it is difficult to understand the builder's lack of foresight.

Elliott & Fry] **Mr. W. J. Jones.** [*London.*

In the majority of instances the subject of lighting only receives attention when the house is actually being furnished, subsequent to painting, wall-papering, &c., and the average householder is then doomed to a restriction of the convenience that is obtainable with the most modern of all illuminants. I should like to emphasise strongly the great importance of early co-operation between the architect and the engineer when a large or special installation is concerned, so as to enable each to understand the practical difficulties of the other. Due consideration should be given to the type of lighting required, both from the utilitarian and decorative aspects, and fittings should be chosen and placed as to form an integral part of the interior.

Scientific knowledge cannot be applied to the home without careful discrimination. To combine science and art is the ideal, and it is with this conception in mind that the lighting artist will illuminate the home of the future. In the first place, let us consider the general requirements of lighting. The illumination provided must be free from glare; all lamps used in the home should be adequately shaded or completely concealed from view. There is now available a complete range of obscured lamps in the sizes generally used in the home, which soften the light produced by the filament; the surface brightness is reduced to quite low values—in some instances to even lower values than are obtained with any other form of illumination. Lamps with inside frosted bulbs, while being as easy to clean as clear lamps, are superior to them for use in the home, since diffusion is obtained with practically no loss of light. In other diffusing lamps, softness of the light is secured to a very high degree, owing to the diffusion obtained by coating the lamp bulbs with a veneer of pure white opal glass or with a coating of china clay. So perfect is the diffusion with lamps of this type that the bulbs resemble balls of light As a general rule, it can be confidently stated that obscured lamps of one or other of these types should invariably be employed for domestic purposes.

Another practical factor in lighting the home is that of providing sufficient intensity. A recent Health Leaflet issued in connection with industrial welfare shows that lighting is of vast importance in the prevention of defective eyesight. It is stated that faulty vision involves a strain upon the eye muscles and the nervous system. This strain in turn produces headaches and fatigue, affects the general health, and reduces one's capacity for all kinds of fine work and the enjoyment of leisure hours. Such occupations as reading, sewing, &c., come under the category of fine close work, and yet in thousands of instances the lighting provided in our homes is insufficient and inevitably produces eye strain. The old idea of providing just sufficient light to enable one to see is, therefore, erroneous, and the provision of good lighting may be looked upon as an investment for the saving of eyesight.

Since it has been recognised that utility combined with beauty is a lighting ideal easily attainable, linking-up the furnishing and decoration of a room with illumination has become a well-established prin-

Fig. 1.—Lighted Frieze Panels.
(*Decoration, André Boll.*)

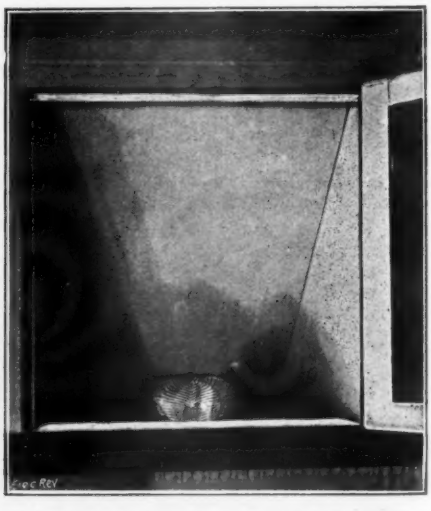


Fig. 2.—Arrangement of Reflector.
(*Decoration, André Boll.*)

ciple. Shades, which in the first place serve to hide the lamp from view and prevent glare, can be made to enhance the beauty of a room already harmoniously conceived.

Research in the past few years has developed many new materials, which may be satisfactorily made up

into lighting fittings. Some care, however, must be exercised in the choice of lighting equipment for the home, and it is important to retain a proper perspective. In some rooms the matter of first importance is that the equipment shall fit in with the general character of the room, and the efficiency of the lighting unit is of secondary importance. On the other hand, in other parts of the house, the unit should have a high luminous efficiency.

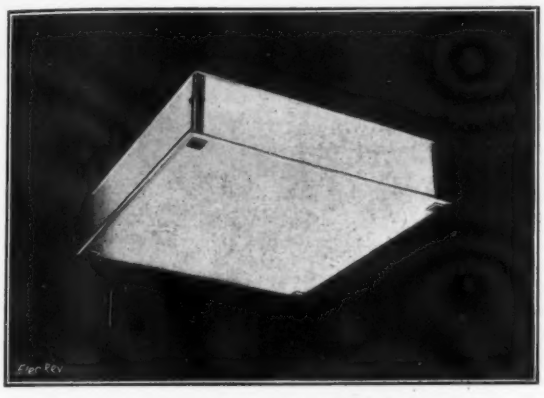


Fig. 3.—Projecting Ceiling Fitting.
(Designer Perzel.)

Contrary to the general belief, it is possible to obtain domestic lighting equipment of considerable decorative value, and certainly capable of giving well-diffused light, at the same time having a luminous efficiency of from 70 to 80 per cent. Progress made in the manufacture of modern opal glass represents one of the factors which have enabled this improved efficiency to be brought about, while illuminating engineers nowadays give considerably more attention to the efficiency of fittings of a more definitely decorative character. For instance, it is common to find coloured silk flounces or shades lined with white silk, and many of the modern translucent materials used for shades and fittings transmit a considerable portion of light and are capable of being tinted on the outside, while at the same time they possess high reflection factors permitting efficient redirection of the light.

Modern Tendencies.

The simplicity of the modern house compared with that of twenty years ago has brought about a corresponding movement in furniture design, and as lighting cannot be separated from the general furnishing of apartments, it has found a fresh means of expression to accord with this modern movement. As a result, we find touches of entirely new lighting in homes making full use of the abundance of new lighting material now available. One noticeable feature of this movement is that the luminous material constitutes some 85 per cent. of the lighting fitting, only 15 per cent. being opaque. Frequently the glass (commonly moulded) is obscured by acid etching or sand blasting, while at times sheets of opal or textured glass are used as the light diffusing medium.

Only a few months ago, in the Grand Palais at Paris, an exhibition was held dealing almost exclusively with interior domestic lighting, and it was noticeable that the lighting element was an essential part of the general design, whether taking the form of applied fittings or of fittings actually built into the structure of the room. Some of the lighting served purely as a luminous decorative element, contributing little to the general lighting of the room, and was entirely supplementary to the general lighting provided in other ways.

In some instances ceiling fittings were introduced in the form of flush or projecting panels, fixed in such a way as to enable easy access to the lamps, both for lamp renewals and cleaning of the glassware. Great care must be taken in the correct location of the lamps themselves to ensure even brightness of the glass panel. These ceiling panels may be of opal or other obscured glass, while occasionally such materials as parchment are employed. In fig. 4 is shown such an installation, where a circular ceiling panel has been introduced for general lighting. Obscured glass is placed in the metal frame in such a manner as to enable easy access above the glass for replacement of lamps and cleaning. Another method of general lighting may be carried out with lighted panels placed at intervals at frieze level.

Fig. 1 shows a small study which is illuminated by means of four glass panels. The light is projected from ordinary shop-window reflectors (fig. 2) through the obscured glass panels on to the ceiling, where it is redirected to the floor. This particular installation proved very successful, and the room, which was about 10 feet square, was lighted with four 75-watt lamps. Incidentally, lighting has been introduced at the springing of the small recessed arch.

Indirect cornice lighting is another modern method of general illumination, but care must be taken that enough depth is given to the cornice for the housing of the lamps, and that it is low enough on the wall to enable the light to reach over half the surface of the ceiling. Unless these precautions are taken, some part of the ceiling will be left dark, giving an unsatisfactory effect. Corner fittings may be introduced in cases where ceiling panels are used, and where insufficient light reaches the corner.

We now come to luminant elements, such as appliqués, which provide luminous decoration. There are numerous designs of these fittings, and in making a choice careful selection of shape should be considered, so that their application may be in harmony with the general character of the room and link up with other elements.

(By courtesy of the Cie. Générale Transatlantique.)

Fig. 4.—Circular Ceiling Panel, used for General Lighting.

Fig. 3 shows a fitting made up of acid-etched or sand-blasted glass and fitted close to the ceiling. It gives practically the same effect as the built-in panel, fig. 4. Satisfactory results may be obtained by applied fittings of this kind when houses have already been erected, provided that some attention has been given to the lighting facilities. Much, however, depends on the careful choice of fittings to harmonise with the general design of the room.

Heat Loss from Thermal Storage Tanks.

The author discusses the various modes of heat loss and shows how far they can be controlled, a working efficiency of 90 per cent. being readily attainable.

By MARGARET FISHENDEN, D.Sc., F.Inst.P.,
Fuel Research Division (Dept. of Scientific and Industrial Research).

Introduction.

SINCE in the generation of electricity in modern stations (say with an annual load factor of 40 or 50 per cent.), capital charges constitute some two-fifths of the total costs, it is obvious that a demand distributed as uniformly as possible is an important factor in economic production. It is for this reason that many electricity undertakings, both in this country and elsewhere, have during recent years inaugurated preferential terms for energy taken during specified off-peak periods—usually during the night—and accumulated on the consumer's premises in the form of heat for subsequent use. Water is most commonly employed as the medium for storing the heat, and may be used either for ordinary domestic purposes or for feeding the radiators of heating systems.

The demands for domestic hot-water are nowadays very high, so much so that in the average household far more energy is required for water heating than for cooking purposes. Thus, although electricity, in face of its competitors, can only hope to find a restricted outlet in this sphere, the possibilities presented may yet be of considerable importance.

In electrical immersion heaters, practically the whole of the heat developed by the current is transferred to the water, and the efficiency of the actual heating process is therefore nearly 100 per cent. In storage systems, however, the proportion of heat which is still available in the hot water for distribution when the time for its utilisation arrives, is reduced through heat escaping from the storage tank. Success is thus dependent upon effective thermal insulation, and it is consequently of some interest to consider the mechanism of the heat losses and the most effective means for their prevention.

Reg. Haines] *[London.*

Dr. Margaret Fishenden.

Mechanism of Heat Loss.

Convection.—When any object is kept at a temperature above that of the air surrounding it, a circulation, known as convection, is set up in the air. The layer of air in immediate contact with the warm object abstracts heat from it, itself becomes warmed, and rises in consequence of its decreased density through the cooler and heavier air around it, which flows in to take its place and in turn follows the same cycle.

Griffiths and Davis* and other observers have shown that heat transfer by natural convection may be expressed as $c\ (\tau - t)^{\frac{1}{4}}$ B.Th.U. per sq. foot per hour, where c is a coefficient which depends upon the size, shape and position of the heated surface, τ its temperature and t the temperature of the surrounding air. For freely exposed vertical plane surfaces of linear dimensions above about a foot, the coefficient c was found experimentally to be 0.30. For horizontal plane surfaces facing upwards, c becomes 0.39, or facing downwards, 0.20, an average of 0.29 for both sides. Thus for a rectangular or cylindrical tank, a mean overall coefficient of 0.30 may be taken.

Heat transfer by convection is accelerated when draughts impinge on a surface. Rayleigh and Boussinesq independently have demonstrated theoretically that this so-called forced convection should be proportional to the first power of the temperature difference between a body and the air currents passing over it, and this conclusion has been confirmed experimentally. The way in which the amount of heat abstracted varies with the velocity of the air currents, however, is closely dependent upon both the shape and the dimensions of the body. This might be expected, since the nature of the air streams around, say, a plane and a cylinder, will be entirely different.

Nusselt and Jurges,* experimenting on a plate maintained at 122 deg. F. in alignment with one of the walls of a wind tunnel, found that the heat imparted to an air current at 68 deg. F., moving at velocities up to 1,000 ft. per minute, was given by the expression $(1.02 + 0.0035\ v)\ (\tau - t)$ B.Th.U. per sq. foot per hour, where v is the air speed in feet per minute, τ the temperature of the hot plate, and t that of the air. It will be seen from this expression that to double the convection loss an air speed of about 300 ft. a minute was required. The draughts experienced in practice would ordinarily be spasmodic and of considerably less strength than this, and would not be likely seriously to increase the heat losses even in adverse circumstances, unless the tank were placed in a very exposed position.

Radiation.—Solid bodies also radiate heat, which becomes continually more intense as their temperature increases. If, therefore, surrounding objects and surrounding surfaces are relatively cool, a warmer body will radiate to them more heat than it receives from them.

* E. Griffiths and A. H. Davis. "The Transmission of Heat by Radiation and Convection." Department of Scientific and Industrial Research. Food Investigation Board, Special Report No. 9. London, 1922. H.M. Stationery Office.

* Nusselt und Jurges. "Die Kühlung einer ebenen Wand durch einen Luftstrom." Gesundheits-Ingenieur, December 30th, 1922.

A so-called "perfectly black" body of absolute Fahrenheit temperature T°, whatever its size or shape, provided that it had no re-entrant surfaces, would lose energy by radiation in otherwise empty space at the rate of about 17×10^{-10} T^4 B.Th.U. per sq. foot per hour For actual materials this must be multiplied by the surface emissivity (E). Over the range of temperatures associated with hot-water storage, E for most surfaces except metallic ones (for instance, for ordinary painted surfaces varying from dead black to glossy white, for bare cast iron, plaster, or brick work), is generally about 0.9. For aluminium or bronze paint it varies from 0.4 to 0.8, while for brightly polished silver or copper, it may be less than 0.05, but is increased by tarnishing.*

In practice the net radiation loss from a heated surface is greatly reduced owing to the presence of surrounding bodies which themselves radiate heat, some of which falls upon and is absorbed by the heated surface itself. In the simple case of a surface of temperature T and emissivity E in surroundings uniformly at T_1 and of emissivity approximating to that of a theoretical black body (*i.e.*, nearly equal to 1), the net radiation loss R is given by the expression :—

$R = 17 \; E \times 10^{-10} \; (T^4 - T_1^4)$ B.Th.U. per sq. foot per hour.

The net radiation loss from heated surfaces small in size compared with their surroundings is only slightly affected by variations in the emissivity E_1 of the surroundings. This, however, no longer holds true for surfaces of the same order of size as their surroundings, but it is useful to note that in all cases R must lie between 17×10^{-10} E $(T^4 - T_1^4)$ and

$$17 \times 10^{-10} \frac{E \, E_1}{E + E_1 - E \, E_1} (T^4 - T_1^4)$$

B.Th.U. per sq. foot per hour. The simpler expression would usually be approximately applicable to the cooling of tanks in ordinary positions, whatever their size or surface finish, in view of the fact that for surroundings of emissivity equal to 0.9, the two expressions can never differ by more than 10 per cent.

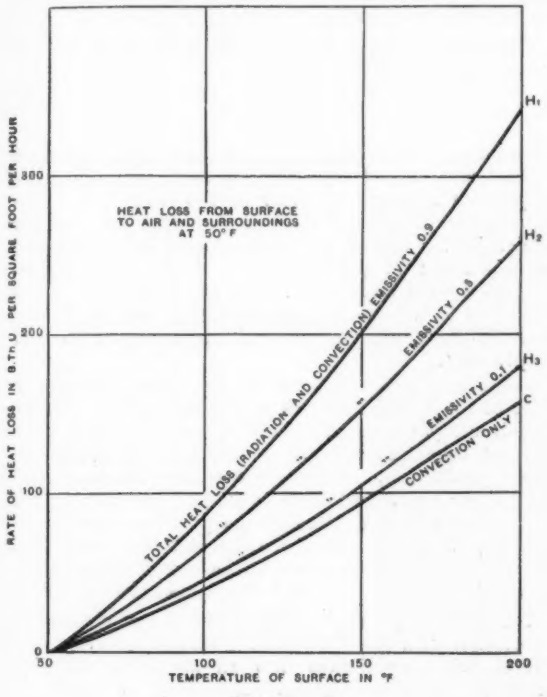


Diagram I.

Total Rate of Heat Loss from Surfaces.

Diagram I shows the rate, in B.Th.U. per sq. foot per hour, at which heat is lost by radiation and convection together when surfaces of emissivity respectively 0.9 (corresponding to cast iron, plaster or ordinary painted surfaces), 0.5 (corresponding to surfaces coated with metallic paint), and 0.1 (corresponding to a polished copper surface), and at temperatures 50 deg. F. to 200 deg. F., are exposed to air and surroundings uniformly at 50 deg. F. This has been calculated from the expression 17×10^{-10} E $(T^4 - T_1^4) + 0.30$ $(T - T_1)^{\frac{5}{4}}$ by putting E equal successively to 0.9, 0.5 and 0.1, and T_1 equal to 510 deg. F. (absolute) and giving various values to T. The rate of heat loss due to convection alone, $0.30 \; (T - T_1)^{\frac{5}{4}}$, is shown separately in curve C on the same diagram; hence the part of the loss due to radiation, 17×10^{-10} E $(T^4 - T_1^4)$, is represented by the differences between the curves H_1, H_2, H_3, and the curve C.

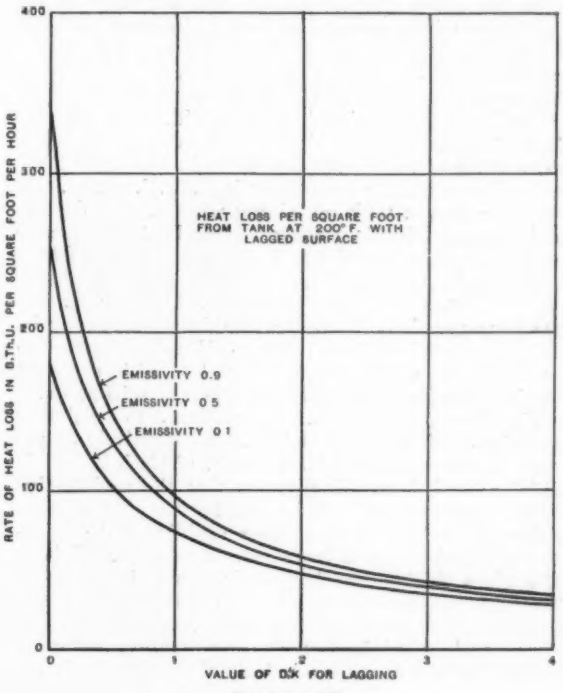


Diagram II.

From these curves it will be seen that, over the temperature range considered, a surface coated with metallic paint of 50 per cent. emissivity loses heat about 25 per cent. less quickly than an ordinary cast-iron or plaster surface, while the rate of loss from a polished copper surface is approximately 50 per cent. less than that from cast-iron or plaster, &c.

Heat Loss from a Lagged Tank Surface.

A more common method of achieving a reduction in the heat lost from a thermal storage tank, however, is by means of a covering of heat insulating material, *e.g.*, cork. This has the effect of exposing to the surroundings a surface at a lower temperature, and consequently of reducing the rate of heat loss in accordance with the curves in Diagram I. Thus, neglecting the resulting increase in external area, in order to halve the heat loss from a tank at 200 deg. F. whose surface emissivity is 90 per cent., it is necessary to add a layer of insulating material sufficiently thick to reduce the exposed (lagging) surface temperature to about 138 deg. F. (curve H_1). The thickness of insulation required to do this may easily be calculated by remembering that the outside surface of the lagging attains an equilibrium temperature such that the rate at which heat is conducted through the lagging material is equal to the rate at which heat is lost by radiation and convection from the exposed surface to the surroundings.

* Coblentz. "Emission Tests of Paints for decreasing or increasing Heat Radiation from Surfaces," U.S. Bureau of Standards Technologic Paper No. 254.
Also Coblentz. "The Diffuse Reflecting Power of Various Substances," U.S. Bureau of Standards. Reprint No. 196.
Also Schmidt. "Wärmestrahlung technischer Oberflaschen bei gewöhnlicher Temperatur." Stahl und Eisen. August 11th, 1927.

The rate of heat loss from a surface at 138 deg. F. exposed to surroundings at 50 deg. F., as obtained from Diagram I, is 172 B.Th.U. per sq. foot per hour assuming the lagging surface to have the same emissivity as the bare tank surface, that is to say, 90 per cent. The heat conducted through the layer of lagging, with inside and outside temperatures 200 deg. F. and 138 deg. F. respectively, is $\kappa/D\ (200-138)=62$ κ/D B.Th.U. per sq. foot per hour, where κ is its thermal conductivity in commercial units, and D its thickness in inches.

Hence, in order that the lagging should possess such insulating properties as to reduce the heat loss by 50 per cent. as postulated, κ/D must be equal to $172/62=2.8$. The effectiveness of the lagging is seen to depend upon κ/D; hence the lower the thermal conductivity the less the thickness required for any given effect. In the particular example taken, the condition that κ/D should equal 2.8 is satisfied by a cork slab less than ¼ in. thick.

In the above calculations the inside surface of the lagging has been assumed to attain the same temperature as the inside of the tank. The thermal resistance of the wall of the tank is small enough for the drop in temperature across its thickness to be practically negligible; hence the lagging in contact with the outer surface of the tank may, without serious error, be taken to be at the same temperature as the inside of the tank.

In Diagram II the loss of heat in B.Th.U. per sq. foot per hour from a tank containing water at 200 deg. F. and covered with insulating material of thickness D and thermal conductivity κ, is shown as calculated from the expressions given. The rate of loss of heat is plotted against D/κ, κ being expressed in B.Th.U. per sq. foot per hour per deg. F., and inch thickness (commercial units), and D in inches. This enables the diagram to be used for calculating the heat loss with sufficient lagging materials as well as for different thicknesses.

The three curves A, B, C, correspond to insulating materials having surface emissivities respectively 90 per cent., 50 per cent., and 10 per cent. of black body. It will be noted from this diagram that the modification in the heat loss produced by altering the surface emissivity of the lagging diminishes rapidly as the thickness of the lagging is increased. Again, the addition of a given thickness of lagging is seen to be less effective the greater the thickness of lagging already present. Such results are, of course, only instances of the general principle that the first measures taken to reduce the heat loss are relatively the most effective.

Loss of Heat from Whole Tank.

It is well known that the shape of container possessing the smallest surface area for a given volume is a sphere. If the container is to be rectangular in shape, a cube is best, while if it is to be cylindrical, its height should be equal to its diameter. Cylindrical tanks are most frequently used in practice, but according to Prof. S. Parker Smith,* in order to avoid undue mixing and awkwardness of shape, it is not convenient to adhere to these proportions, the most suitable tank being that in which the height is about twice the diameter. This shape, in which the surface area for a given volume is increased only by about 5 per cent. over the minimum, has been taken in the calculations in the present paper.

In order to obtain the total rate of loss of heat from a tank, the rate of loss per unit area of surface, given in Diagrams I and II for unlagged and lagged tanks respectively, must be multiplied by the surface area, *i.e.*, 13.0, 16.5, and 26.5 sq. feet for cylindrical tanks for 20, 30, and 60 gallons capacity respectively, of height equal to twice diameter.

The curves given in Diagram II, however, no longer apply accurately if, as may happen with very small tanks, the lagging has a thickness comparable with the diameter. In this case its effectivity is reduced, although in less ratio than the proportional increase in surface area. With large tanks the thickness of insulation will usually be small compared with the linear dimensions, and the heat losses may thus be estimated closely on the tank area.

On the assumption that the whole of the heat generated in the electrical system is transferred to the water, the total energy imparted to a storage tank must be sufficient both to raise the temperature of the water to the required degree (say an amount h_1) and to balance the heat losses (h_2) over the heating period. The quantity h_1 is obviously given in B.Th.U. by $10.v.\theta$, where v is the volume of water in gallons, and θ the difference in degrees F. between its initial and final temperatures. Values for h_2 can be estimated on the assumption of a uniform rate of rise of temperature by multiplying the heat loss at the mean temperature (*i.e.*, $(50+200)/2$, or 125 deg. F.), obtained by halving the values given in Diagram II, by the surface area of the tank in sq. ft., and the number of hours over which the heating extends.

The actual percentage efficiency with which the hot water is produced is evidently

$$100\ \frac{h_1}{h_1 + h_2}.$$

Thus for an installation taking its current over the eight night hours, say, from midnight to 8 a.m., in order to produce a supply of water at 200 deg. F. for subsequent use, simple calculations show that the working efficiencies for unlagged 30- and 60-gallon tanks would be only about 71 per cent. and 75 per cent. respectively. By the addition of a layer of insulation with D/κ equal to 4, however, corresponding to some 2 inches of cork, these efficiencies could be increased to over 90 per cent.

At normal prices, electricity for water heating, in spite of the very high efficiencies with which it is associated, compares unfavourably in cost with the independent coke-fired boiler. On the basis of equal hot-water production, in fact, the costs with electricity at 1d. per unit, and coke at 40s. a ton, are in the ratio of 6 to 1; and although the position may be considerably improved where the demand is intermittent, the discrepancy is too great to be completely counterbalanced in other than very exceptional circumstances.

The possibility of retaining maximum efficiencies in association with low "off-peak" tariffs, however, may put electrical appliances into an altogether different category for water heating. According to Snell* the total costs of generation in a modern station working at an annual load factor of 40 or 50 per cent., may be subdivided into:—Coal, 46 per cent., capital charges 40 per cent., and other costs 14 per cent. Several stations have now cut down their coal consumption per unit of electricity generated to less than 1.5 lb. which, at 20s. a ton, amounts to 0.16d. In such stations, according to the estimated division of expenditure quoted, the total cost of production should be only about 0.35d. Hence, in order to reduce still further the capital charges by improvement of the load factors, it might be worth while, during suitable periods, to dispose of power at 0.35d. a unit, or even less.

At this price, electricity for water heating costs about twice as much as coke, or about the same as gas at 8d. a therm. For continuous requirements on the large scale, solid-fuel boilers will thus have a substantial advantage; but in many cases the indirect saving effected by automatic action, cleanliness, and the elimination of fuel storage may, especially in view of the certainty of ample supplies of hot water, be worth more to the consumer than the difference in running costs. Future developments in storage heating will indicate the extent to which such compensations are applicable.

* S. Parker-Smith and N. M. Macelwee. "The Heating of Water by Electricity for Domestic Purposes." World Power, January, 1926, and February, 1926.

* Snell. "The Present and Future Development of Electricity Supply." Presidential Address, British Association, Section G, 1926.

Refrigeration and the Electricity Supply Industry.

The author explains the necessity of refrigeration in the home, and demonstrates its importance to the electricity supply undertaking as a "valley-filling" load.

By L. R. MORSHEAD.

IN view of the interest now being shown in the applications of refrigeration to food preservation—and indeed, in view of the absolute necessity for this means of preservation—an attempt to develop the alliance between the electricity supply industry and the producers of "cold" may fitly find a place in a "Domestic Electrification" number.

The whole tendency of health regulations to-day is towards a complete "pure food" supply. The definite conclusion has been reached that the one safe and proper means of preserving the nation's food, from its production to its final consumption, is refrigeration; and in the production of "cold," in the demonstration of its uses, and in the sale of domestic refrigerating apparatus, the electricity supply industry can and must play an important and a profitable part.

From the domestic aspect, refrigeration will be regarded mainly as a preserver and saver of foods; but it should also be understood that it plays a very important part in allowing the maturing of many articles of food, the digestibility and palatability of which are improved by "keeping" at a low temperature. Every housewife knows the extra value of food which is appetising, its effect upon digestion and upon the tempers of those who consume it. Even if the preservation of food were of less importance, there is still value in the maturing of food, in the retention of flavour and sweetness, and in the possibilities offered of serving cold dishes, jellies, creams, salads, fruits, and drinks so that the appetite is whetted and the flow of digestive juices increased—value sufficient to make the refrigerator an essential item of domestic equipment.

Malcolm Arbuthnot [*London.*

Mr. L. R. Morshead.

The fact that moisture and warmth are the two prime factors in decay, the main enemies of preservation of food is common knowledge, but the processes are less understood, and cannot be too often described. The processes of decay, spoilage, or deterioration of foods are due to two main living organisms—the microscopic plant life of moulds and yeasts, and the bacteria which inhabit the living substance or are deposited upon the dead food. The plant life needs moisture and can thrive on water-containing substances such as meat, milk, vegetables, jellies and bread; given favourable temperature conditions, it grows with great freedom and rapidity, and attacks the foods, producing odours, altering the composition and flavour, and hastening that decomposition which is inevitable when life is destroyed. Bacteria also multiply at a rate which increases with the warmth of their habitation, and in their development and death they cause decomposition and putrefaction. They produce definite chemical and organic changes, and generate toxic substances which are often dangerous to health, and some of which are deadly poisons.

Most of the poisonous products are found in the state known as putrefaction, and a warning is given by the nauseating odours or flavour of the food substance, but some of the most deadly poisons are developed without any immediate effect upon either odour or flavour; such cases, though rare, are now and then brought to our notice by tragic and only partly explained accidents causing a number of deaths. Frequently such cases occur after the eating of cooked foods in which the original bacteria must all have been destroyed, and they show the great need of care in the keeping of such foods, which must be stored, even for short periods, under conditions in which bacteria can have no encouragement to multiply, or even the opportunity to attach themselves to the food.

The refrigerator provides the only means whereby safe conditions can be assured. Nothing short of freezing and storage at temperatures well below freezing point will definitely prevent bacterial development — and certain moulds will, even at these low temperatures, secrete themselves in cosy corners to which the cold draughts of air do not penetrate, and will thrive modestly without, however, causing serious damage.

We are not concerned with the long storage of foods and perishable commodities. The housewife requires a margin of safety in her household economy, and this means the keeping of fresh and cooked foods, of milk and butter, vegetables and fruit, eggs, cheese, and meat and bacon, for periods of two days to a week, or even two weeks, according to the normal keeping properties of the foods. It is generally conceded that at somewhere about 48 deg. to 50 deg. F., the line between safety and danger lies; below this line, in a circulation of dry air, the development of moulds and bacteria is arrested. It is desirable to aim at an average temperature of 45 deg. F. This can be held by mechanical refrigerators or by ice boxes, properly designed to provide good air circulation, and well insulated to prevent transference of heat. A difference of about 10 deg. F. between coldest and warmest air is unavoidable, and is indeed necessary to proper circulation. The coldest air is immediately below the air outlets of the ice chamber or the evaporator chamber of the mechanical plant, and it is here that milk, butter, and jellies should be placed. Meats uncooked should occupy the next compartment, and eggs, vegetables, &c., should be placed in the warmer air near the outlet to the ice chamber.

With either type, the air circulating in the food chambers is "dry": that is to say, its humidity is kept below saturation point. The warmed air rising from the food chambers passes in contact with the cold surfaces, giving up its heat, and also its moisture, and depositing with the latter the organic matters which form odours. Cooled to a temperature approaching that of the melting ice or ice-coated surfaces of the evaporator of the mechanical refrigerator, it falls to the food chamber, always well below saturation point as it makes contact with the food containers, extracting heat as it moves, and eventually rising and returning to the cooling chamber. On the Continent the practice is growing of fitting a small electric fan to every ice box, thus ensuring definite and ample air circulation.

The true function of the electricity supply engineer in his capacity as "Domestic Economy Engineer," is not that of a seller of mechanical refrigerators, but that of a seller of "cold" or heat-extraction duty, as he is a seller of heat, light, or power. He must, therefore, make a study of the uses of cold in every sphere, its effects on the domestic food question, the part it can play in the production and serving of appetising and wholesome dishes, and its luxury possibilities. The luxury of to-day becomes the necessity of to-morrow, and the possibilities of energy consumption in the production of "cold" are unlimited. It matters little to the electricity supply manager whether the "cold" is produced by direct mechanical means, or indirectly by the melting of ice, so long as the production of ice is the result of the use of electrical energy. It must be considered that for one housekeeper who can afford the initial cost of a mechanical refrigerator, there are many who can and must ere long install a well-made ice refrigerator. Further, every user of an ice refrigerator is a potential customer for a mechanical refrigerator as his or her appreciation of the uses of "cold" increases.

There has been much unwise and untrue matter published during the selling campaigns of the mechanical refrigerator organisations, and some unwise retorts and criticisms have been made by ice-makers in reply. The thing that matters is the extension of the uses of refrigeration, from which both sides of the industry will benefit, and the electricity supply manager will gain, either way.

A wide experience of the ice-making and cold-storage business enables me to state definitely that, if a reasonable supply of electricity is available, no refrigerating plant should to-day be driven by any other form of power. By this I mean that the profit-earning value of this load is such, that the electricity authority can quote terms for the supply which make steam, oil-engine, or gas-engine drive unprofitable. The load is better than any 100 per cent. load factor of equal consuming power, because it is essentially a "valley-filling" load, and can easily by mutual arrangement be made entirely a "non-peak" load. The refrigerating load is the natural reciprocal of the heating load, and it can be made also the reciprocal of the lighting load, the tramway load, and, to a large extent, of the cooking load, all tending to the production of that desirable table-land into which every supply manager hopes to see his mountainous daily and yearly load curves converted.

The cold-storage manager also now appreciates the advantages of the electric drive, its cleanliness, saving of labour, low maintenance, and ease of operation, freeing the staff to attend to other services than that of power generation, and he is ready to take advantage of any reasonable terms for the supply of electricity.

The more even turning moment allows of the speeding-up of compressors when converted from engine to electric drive, increasing the output of the existing plant, and in every case also setting free valuable space to accommodate extensions.

Let us consider what this refrigerating load may mean in increased demand on the electricity supply mains. In the United States the ice output, benefited by the competition of mechanical refrigerators, has approached 60,000,000 tons a year. At an average of 50 kWh per ton, this would equal a consumption of 3,000,000,000 kWh, *the whole of it "non-peak" and available for filling up the valleys in the load curve.* Add to this the thousands of plants great and small, producing "cold" for food preservation, and for hundreds of other services, most, if not all, of which are "valley filling," and the great possibilities of the business will be realised. In this country the ice production is under 1,000,000 tons per annum for domestic uses—hotels, butchers, fishmongers, and the like being included in this category. A further 1,000,000 tons a year is supplied to the fishing fleets and trade. Let us not argue, as unfortunately many in the refrigerating industry do, even publicly, that this country is not the United States, and never will have the same business in proportion to its population: the refrigerating business is not useful in hot countries alone. It is of importance in temperate and humid climates, and even in colder climates, for all our houses are warmed, and our food needs protection against local warmth, moisture, and the mould- and bacteria-carrying atmosphere.

The proper distribution of food in the cabinets must be studied, as different foods, raw and cooked, are best preserved at differing temperatures, and the circulation of air must be studied both in the mechanical and in the ice refrigerator. Some foods should be stored in closed containers, others uncovered in the air draught. Drainage arrangements must be considered, and all refrigerators should be connected to a suitable overflow to take away the water produced by melting ice or the thawing of iced surfaces. A tray under the cabinet to retain a quantity of the cold overflow provides a cooler for bottled drinks and foods, and saves opening the cold food chambers. Aim at efficiency, at obtaining the maximum heat extraction duty, and the minimum loss. Recommend only the best insulated, best constructed, and most readily cleaned cabinets.

In the business of refrigeration as we have been considering it, applied chiefly to domestic uses, the production and sale of heat extraction units presents the same commercial problems as face any manufacturing business, and those of overhead charges and distribution costs must in the near future be dealt with in a broad manner. In some places in which ice production is concentrated in plants of large output, and a regular demand exists, a high economy of production is attained, which enables ice to be sold and delivered in bulk for a few shillings per *ton*, whereas in other places the small consumer pays as many shillings per cwt. Costly plants, and full staffs, are maintained by many factories to meet a maximum demand which may only occur once or twice in ten years. The concentration of production, with reduction of running and overhead charges to a minimum, must precede the widest use of ice. Where could this be more fully accomplished than at the electricity generating station? A wide margin of flexibility is possible, and the control of production by the station staff, utilising surplus energy and surplus plant, would certainly result in a total cost lower than anything known to-day.

I am not suggesting, but would deplore, competition of electricity generating undertakings with the established ice trader. The latter should retain the whole business of distribution from the ice tank platform to the consumer, and, freed from the cares and responsibilities of production, would be able to concentrate upon the development of the sale of his commodity, and upon the means and methods of reducing his distribution costs. It is a fact that no organised efforts have yet been made in our cities to push the sales of ice. A canvass of some of those areas in London in which the wholesale conversion of large residences into inconvenient flats has taken place will disclose the fact that not one resident has ever received so much as a postcard referring to ice; attractive leaflets explaining the use of cold, and stating where and how refrigerators and supplies of ice could be obtained, would certainly result in profitable sales.

The Wiring of New Houses.

In order that full benefit may be derived from the increased availability of electricity, it is urgently necessary that new houses shall be properly equipped for that purpose. The Electrical Association for Women has issued the "Women's National Specification" to represent the woman's point of view.

By MRS. WILFRID ASHLEY,
President of the Electrical Association for Women.

WE have become so accustomed to "lightening our darkness" through the medium of electricity that we are apt to leave it at that! To realise what else can be brought about through electricity we have only to turn to America, and there we find a somewhat different state of affairs. Electricity in that country is freely used as a motive power as well as a means of lighting. Now the time has come for the women in Great Britain to demand its use as a labour-saving agent, and before they can make this demand they must acquire more than a little knowledge as to its application to their daily life. Once an unlimited supply of current is assured, in any district, no time should be lost by architects, builders, and house-owners in seeing that full advantage is taken of the power at their door all ready for use in the home.

Undoubtedly this country is behind the times in its general use of electricity, but with the passing of the Electricity Supply Act of 1926, there is now the prospect before us of an adequate supply of cheaper electric power. This state of affairs cannot come about through the mere waving of a wand on the part of the Central Electricity Board; it will take time, and pending the completion and carrying out of their supply schemes, it would be well for us all to realise the change that is being made, and to prepare ourselves for the day when we shall have cheaper electricity owing to organised output.

Raphael] [London.

Mrs. Wilfrid Ashley.

As far as our own homes are concerned, women are the best advocates; they must create the demand, and they must see to it that when the time comes and a cheaper supply of electric current is available, their homes shall be already wired for its domestic use. Newly-built houses should be wired during their building in such a way that the vacuum cleaner, electric polisher, electric dishwasher, and refrigerator may be part of the house equipment, and not the uncommon adjuncts to a home that they are at present. Old houses present a difficulty, as they are, of course, wired only for lighting purposes, but as far as electricity is concerned we must realise that we are passing through a period of evolution, and that such a time must bring with it difficulties of every description. Greater knowledge of the use of electricity will bring in its train a greater demand, and this fact should not be overlooked by the builders of to-day and to-morrow. Visits to housing estates in different parts of the country have shown that most of the houses are being wired in such a way that when cheap electricity is an accomplished fact, the women in those homes will not be able to avail themselves of this new aid to their daily life, owing to the cost of wiring *after* their house has been built. It is always a pity to spoil a ship for a ha'porth of tar; is it not also short-sighted to economise in electric wiring?

Women, I am glad to say, having gained some small knowledge of the advantages appertaining to electricity as a means of rendering home comfort more easily available, are making their voices heard in no uncertain way. Women are persistent creatures, and they know what they want. They are beginning to realise that through the medium of electricity they can make the burden of their housework lighter, and gain comfort for themselves and the breadwinner at a less cost than has been their lot in the past. To hasten the attainment of that ideal, the Electrical Association for Women was formed, four years ago; already it has a membership of some thousands of women, and it has made its influence felt in every part of the country. In addition to its many other activities, the E.A.W. has launched an "Electrical Outlet Campaign" this autumn, and it has especially investigated the attitude of the local authorities with regard to the provision that is being made for electrical service in the new houses which they are building.

Some twenty-five housing estates, representing over 2,000 houses, have been visited by members of the Association, who were sadly disappointed to find that whilst electric lighting was installed almost everywhere, little or no provision was being made for electric heating and cooking; moreover, some of the electricity supply undertakings themselves showed little interest in the subject. It was abundantly evident that action was urgently called for, and the Association has prepared the "Women's National Specification," which is being sent all over the country to architects, builders, and the authorities responsible for housing estates, to impress upon them the necessity of installing power outlets when the houses are being wired. In addition, meetings are being organised by the branches of the E.A.W., and efforts will be made not only to guide builders and electricity supply authorities in the way they should go, but also to educate the general public in the uses and advantages of electricity in the household.

F

The Demonstration of Electric Cookers.

To Overcome the Conservatism of the Public, Efficient Teaching Methods are Essential.

By ANNIE MOLE.

LOOKING back over the past twenty-five years, the design of electric cookers may strike one at a casual glance as not too progressive. Manufacturers may appear too often to be imitative, and all cookers are more or less alike in design, following the gas-stove type. The manufacturing designer's work is not an easy task; he not only has to produce an efficient cooker, but also he has at the same time to study his market and to cope with the preference of the public for something resembling the gas stove which it has grown so accustomed to use for years.

I think the difficulty of educating the public has always been met with in years gone by with other cooking apparatus. First there came the kitchen range, taking the place of the more primitive open coal fire and the spit; I remember one dear old housewife who, on having a closed kitchen range installed, never used it—it was something different, something new! Then gas stoves came along, and at first they were met with the same objections, but the very clever methods of demonstration adopted soon convinced the cook and the housewife that there was "something in it," and the gas stoves came to stay.

We have been demonstrating electric cooking for the past twenty-five years—but have we grasped the *best way* to educate the public with regard to the advantages of electric cooking? I am decidedly of opinion that we have not.

To-day the demonstrator's hardest task is to convince the public that electric cooking is not an expensive luxury; the idea that it is costly is often so deeply rooted in their minds that it needs more than words to convince them otherwise.

W. J. Scott] [*London.*

Mrs. Annie Mole.

I have found it an excellent plan in giving lecture-demonstrations to have a meter beside the cooker which the audience can read as easily as telling the time on a clock face; then I cook a good plain meal and prove that with electricity at a reasonable price, the cost often works out less than with gas. At the same time the public must be educated up to the value of a thermometer as a guide; if this were more thoroughly understood, much waste of current and residual heat might be avoided. The value of residual heat is not appreciated as it should be; a well-lagged cooker reduces the cost of cooking, and gives better results.

I hope I may not be thought presumptuous in expressing strong views on electric cookery demonstrations and the way in which they are conducted; but after twenty-four years' experience in the work I have a wide knowledge of the methods by which consumers are generally persuaded to take up electric cooking.

It may happen that the manufacturer has been invited to give a "show." The demonstrator goes forth with the best intentions to do good business for her firm and for the supply authority which has given the invitation.

She arrives, to find that it is a "window show" in a new showroom where cheap electricity is just being introduced. The public look with awe at the new showroom, and gaze with greater awe at the display of dishes exhibited for their inspection. They wonder what it can all mean, not daring to tread on the new door-mat, in spite of a card in the window: "Cookery demonstrations now on" (one might just as well put a French book in front of them and expect them to read it off, as expect people to learn by looking through the window).

Consequently, at the end of the week the demonstrator goes back to her employer with no orders, no encouragement for her labour, and no results to the supply authority.

There are and will be many electricity supply undertakings with decreased rates of charge which will eagerly seek a good cooking load, and to my mind there is only one way to get it.

Demonstrations are a great expense to the manufacturer, and if it is to pay him to bear the expense of these demonstrations, it can only be done in one way: they must be given with good convincing *lectures*. Teach the public what electricity means to them, what electricity will do to give them a clean, healthy diet, not forgetting the economy of keeping the housewife fit with less labour; and make the lectures interesting with useful cookery — not sausage rolls and jam sandwiches, but cookery that will help them to economise, to build up their bodies and repair the waste, with hints on food values. A few years ago I lectured in a provincial town for a week, having a separate room apart from the exhibition, where I lectured at 3 and 7 o'clock. At the end of the week I had a letter of congratulation from the supply authority, stating that the demonstrations and lectures had resulted in 100 orders for cookers.

Such demonstrations and lectures are not only of benefit to the public, but also to the salesman, who is often found wanting in knowledge in matters of cookery. Convince the whole staff and the public that there is nothing in the world like electric cooking, and it will do much to bring about better design in apparatus and better salesmanship in the showroom.

One word in conclusion: should there not be, in the making of a good cooker, a frequent series of tests of the apparatus by a good cook? It is one thing to bring out a cooker to please the eye—and another to bring out one acceptable in every way from a woman's point of view. Some of our best-known manufacturers have followed this policy in the past with advantage.

Electrical Advance in Australia.

The Example of Victoria.

By LIEUT.-GENERAL SIR JOHN MONASH, G.C.M.G., K.C.B., Doc. Eng.,
Chairman of the State Electricity Commission of Victoria.

WHAT might be termed a wave of electrical sentiment is at the present time sweeping over Australia. The people generally have ceased to think of electricity in terms of light merely. They are realising that electricity is not only lighting the world, but lightening its labours, and that its application to the many and varied tasks of the home and the farm relieves monotony, banishes drudgery, and raises the standard of living. Domestic tariffs are being framed and studied from the point of view of the all-electric home; the merchandising of household labour-saving electrical devices on easy payment terms is receiving attention from many of the principal supply authorities, and in all directions there are encouraging signs that the time is approaching when electricity will take its proper place in Australia as the universal servant of the farmer and the housewife, for the reason that it is enabling economy to go hand in hand with efficiency, comfort and sanitation.

Victoria's National Scheme.

The Victorian National Scheme of electricity supply is not only unique as far as Australia is concerned, but it possesses many features of world-wide interest. It was conceived in 1917, when it became apparent that the city of Melbourne was fast approaching a serious shortage of electrical power, with little prospect of being able, economically, to meet the situation. All of the existing power stations were dependent upon black coal imported from New South Wales, and as the cost of this was increasing, whilst recurring industrial troubles were interfering with the continuity of supply, additions to installed plants, or the erection of new power houses, which would be similarly circumstanced, could not be regarded with equanimity.

Lafayette [*Melbourne.*
Lieut.-Gen. Sir John Monash, G.C.M.G., K.C.B.

The alternative was the utilisation of the State's own unlimited resources of low-grade fuel, represented by vast deposits of brown coal in various locations, but chiefly in the valley of the Latrobe River, at Morwell, Gippsland, about 90 miles from Melbourne. Here thousands of millions of tons of brown coal, averaging about 200 feet thick, lay at a depth of comparatively few feet from the surface. The Government of the day accordingly appointed an Advisory Committee on Brown Coal for the purpose of investigating the possibilities in this direction. The findings of the Committee were entirely favourable, and at the end of 1918 an Act of Parliament was passed, constituting the State Electricity Commissioners. The name and constitution of the Electricity Commissioners were altered by the State Electricity Commission Act, 1920.

The Commission is empowered to construct, acquire, maintain and work any electrical undertaking, and to engage in the bulk or retail supply of electricity; the rates chargeable by any undertaker whom it supplies in bulk are at all times subject to its approval and control. The general duties assigned to the Commission include:—

(*a*) The ultimate co-ordination and unification of all electrical undertakings, and the adoption of such standards of plant and equipment and of system frequency as will admit of the efficient interconnection of such undertakings and the interchange of electricity between the stations, and, generally, the safe, economical, and effective supply of electricity throughout Victoria, and the amalgamation of such undertakings;

(*b*) The encouragement and promotion of the use of electricity, and especially the use thereof for industrial and manufacturing purposes;

(*c*) Ascertaining the extent of the generating resources of Victoria, both fuel and water;

(*d*) The administration of the Electric Light and Power Act.

The scheme has been in commercial operation for about four years, and it is interesting to trace the extent to which the duties of the Commission have been translated into actual practice.

The first and specific duty of the Electricity Commissioners under the 1918 Act was to submit a scheme for a coal-winning and electrical undertaking in the neighbourhood of Morwell, where the Mines Department had already done considerable research and practical work in proving the vast extent of the deposits. The duty was also imposed upon the Commissioners of investigating the "relative practicability of utilising water schemes for electrical undertakings."

The Commissioners took a comprehensive view of their duties, and not only dealt exhaustively with the possibilities of a hydro-electric scheme on the Kiewa River, in the north-eastern section of the State, but also examined the economics of a fuel-generating station at Altona, which is situated on Port Phillip Bay, a few miles from Melbourne, of which it is a suburb. There are considerable deposits of brown coal at Altona, but they are only to be won by deep-mining, the cost of which was found to outweigh any advantages which the field possessed over Morwell, by reason of its proximity to the chief centre of demand. The Kiewa River pro-

posal, which was estimated to produce 37,000 kilowatts, at an estimated capital cost of £3,715,527, was rejected, because as an adjunct to a fuel generating station it was of greater magnitude than the requirements warranted, while it could not be considered as an alternative to a fuel-burning station, because in that case it would not fulfil the requirements, and offered no scope for expansion.

Yallourn.

The recommendation of the Commissioners was that the Morwell field be opened up by means of open-cut operation, and that a power house of an initial capacity of 50,000 kW be established thereon, with the necessary transmission line to Melbourne. This recommendation was approved by Parliament at the end of 1919, and in 1920 a commencement was made to give full effect to the scheme, which included a factory for the manufacture of brown coal briquettes and the establishment of a new and self-contained town about one mile from the power station.

The name given to this town—which conforms to a carefully-designed housing scheme, in keeping with modern ideas of town-planning—is Yallourn, and the State scheme has come to be commonly known as the Yallourn undertaking. Having as its basis the utilisation of a low-grade high-moisture fuel in the generation of electrical energy on a superlative scale, the scheme is attracting world-wide interest.

The scheme is still in the developmental stage, however, and, in order that it may be viewed in its proper perspective, its actual achievements should be taken as being simply indicative of future possibilities, as, although the progress made has been rapid and satisfactory, Victoria, even with its present population (less than two millions, spread over an area of 87,884 square miles), is still a very long way from the saturation point in the use of electrical energy. From the point of view of service to the community, however, Victoria's national system is unique amongst similar undertakings the world over, because nowhere do transmission lines stretch for such distances over sparsely-settled areas. Stated in another way, Victoria has perhaps a greater length of transmission lines *per capita* than any other country in the world.

The only section of the State which the national scheme does not serve is the North-West, which includes Victoria's two most important provincial centres, *viz.*, Ballarat and Bendigo, both of which are supplied by a private company, under franchises which do not expire until 1930. The Government has announced that, as a matter of public policy, these franchises will not be renewed, and that both cities, as well as some of the districts beyond, and the territory between them and the metropolis, will be linked up with the national system. This will represent a most important extension of the operations of the national scheme, and, as each new extension brings further districts within economic range of supply, a very long step will have been taken in the direction of the ultimate complete electrification of the State.

Rural Electrification.

Already over 100 rural centres are receiving a supply of transmitted energy. In some of these centres local undertakings were acquired by the Commission, but in the great majority of instances the Commission has initiated supply, and in this way electrical energy, with its uses and comforts, has been carried into many remote areas which would otherwise not have enjoyed these advantages for an indefinite period.

Many farmers, either individually or in groups, are taking supply from the Commission, and in most of these instances electricity is being applied to the usual tasks of the farm, such as cutting chaff and firewood, grinding corn, working elevators, milking, separating, &c. Electricity is such a boon to the remote country dweller that, once having obtained it, he is anxious to exploit its advantages to the fullest extent, and in some farmhouses and other rural dwellings are to be found all those electrical labour-saving devices which eliminate drudgery and add to the amenities of home life. In a number of such instances, electric stoves are in daily use, despite the fact that firewood exists on the holdings and costs nothing more than the labour of cutting and carting it.

In such respects the rural resident is in advance of the ordinary city dweller, to whom electric light is such a commonplace service that he becomes inclined to think of electricity in terms of illumination only. His thoughts, however, have undergone a revolution, due chiefly to the formulation of tariffs which direct his attention to the economies to be effected by the liberal use of electricity for all purposes in the home, and to the lessons conveyed by the comprehensive All-Electrical Exposition held in Melbourne late last year, when the utility and simplicity of a very wide range of domestic electrical appliances were fully demonstrated each day for nearly a month to a large and ever-growing number of the public.

Tariffs.

As indicated, suitable tariffs are influencing the trend towards the all-electric home.

The Commission supplies practically the whole of the electrical requirements of the metropolitan area of Melbourne. It directly controls one large district, and in each of the other districts the undertakers buy their supplies in bulk from the State scheme. The Commission, by virtue of its statutory powers of "price control" over those undertakings which purchase their supplies in bulk from it, has, therefore, a control of the rates chargeable to consumers in the whole of the metropolitan area. It has exercised its powers to secure the introduction of standard metropolitan tariffs, which include a domestic two-part tariff, comprising a service charge of 1s. per room per month (passages, pantries, porches, verandahs, lavatories, &c., not being counted), and an energy charge of 1¼d. per unit, with no meter rents. Electricity for cooking at hotels, restaurants, &c., is provided at 1¼d. per unit, and continuous water heating at a fixed charge of 3s. 9d. per month per 100 watts capacity. There is a block rate for industrial power (stepping down as consumption increases from 2d. per unit to 0.8d. per unit) and also a maximum demand rate of 17s. per kW per month, plus an energy charge of 0.3d. per unit. These charges, which have had the effect of stimulating the use of electricity, will be reviewed as circumstances permit, the Commission's policy being to supply electricity at absolute cost to consumers. They have always been the Commission's charges in its own metropolitan district, with variations in country districts to cover the extra cost of making supply available thereto. In all of the undertakings acquired by it, existing consumers are given the option of remaining on the old flat rates obtaining at the time of acquisition, which in most instances amount to 1s. per unit for light and up to 6d. per unit for power. Such consumers are changing over to the two-part tariff in larger numbers every year, but, after including those who have not yet changed over, and taking into account all areas, even the most remote, the average price to domestic consumers in all the Commission's own undertakings throughout the State was something more than 5d. per unit during the year ended June 30th, 1927, while industrial power was supplied at an average charge of 1.3d. per unit. The average price of domestic and industrial supplies, taken together, was 2.45d. per unit during the same period, and these figures will show an improvement this year, and are certain to become progressively more favourable.

The aim of the Commission has been to keep tariffs at a level which will ensure supply at a reasonable figure and develop the load on the system. The foregoing is a general survey, and is intended to give an impression of the scheme and the results that are accruing from its operations.

Co-ordination and Concentration of Supply.

The Commission has now approximately 1,500 route miles of overhead and underground high-pressure trans-

mission lines in operation, carrying energy for distances up to 300 miles from the main source of supply at Yallourn.

The whole system is standardised in all respects, and, as all the Commission's power stations are interconnected, they are simply concentrated into one super scheme of supply. The conversion of the whole of the metropolitan system from single-phase to three-phase has been effected, and all rural undertakings acquired have also been converted to the standard system of supply. Where the initiation of purely local undertakings has been permitted in certain rural towns which do not now, but may eventually, come within economic range of transmitted supply, care has been taken to ensure that the Commission's standards are observed.

The Commission will directly control most of the metropolitan area in 1930, when the extensive undertaking of the Melbourne Electric Supply Company, Ltd., will be acquired under an agreement which has been ratified by Parliament. The Geelong undertaking of this company will also pass to the control of the Commission in the same year, together with those at Bendigo and Ballarat, of the Electric Supply Company of Victoria, Ltd. As the Commission already directly controls over 100 towns in the State, it will be appreciated that very definite progress has been made in the direction of the "unification of all undertakings," as directed by Parliament when inaugurating the scheme. As the scheme is emerging from the developmental stage with such excellent prospects, public confidence in its policy and soundness has increased, and it is safe to assume that rural municipal undertakers at least will desire to surrender their orders so that their districts may enjoy its benefits wherever transmitted energy may be made available.

Financial.

At the present time the scheme represents a capital expenditure of approximately ten and a half millions. The briquetting plant adds over half a million to this total. The new power house at Yallourn, together with the duplication of the main 132,000-volt transmission line and the provision of a new terminal station at Melbourne—which form part of the proposal—are estimated to cost £2,806,000, while the extensions to the briquetting factory will absorb £725,000, so that the total capital expenditure in sight is approximately £15,000,000.

The scheme has been called upon to pay interest on construction from the outset, as well as interest on the interest which accumulated during the constructional period of about four years before it commenced to earn revenue. These are burdens which private undertakings are not called upon to bear to anything like the same extent. Despite the fact that the scheme has been on a revenue-earning basis for only four years, its revenues from electricity supply are approximating one and a quarter millions annually, and during the financial year ended June 30th last it provided a surplus on this branch of its operations of about £50,000, after meeting all interest obligations and charging full depreciation on the whole capital expenditure. The finances of the briquetting branch have also improved, and when the present "half" or experimental factory is placed on a commercial footing by the extensions now being made, there is no reason to doubt that past losses on its operations will be rapidly overtaken.

Providing for the Future.

The scheme commenced to function commercially in April, 1924, with two power houses—that at Yallourn, and a peak load station of 15,000 kW at Newport, Melbourne.

A year after the commencement of operations, the plant was carrying a daily peak load of 40,000 kW. The public demand for power has rapidly increased, and it is expected that this year the maximum demand on the system will approximate 83,000 kW.

Forecasts of probable demand, based on statistical material, observation and experience, have enabled the Commission to anticipate increments of load by progressive installations of generating plant. In this regard it was considered sound to establish a hydro-electric adjunct to the fuel generating stations, especially as an appreciable block of power could be produced at the Sugarloaf irrigation dam, at the junction of the Goulburn and Delatite Rivers, without the expense of head works, the heavy cost of which, and the distances of potential schemes from the chief centres of demand, constitute the chief drawbacks to the utilisation of hydraulic energy in this State.

Complementary to the Sugarloaf station are four power houses on the mountain streams of the Rubicon, and between them the five stations will provide a uniform output of at least 11,500 kW, the flow in the mountain streams being at its maximum in the winter time, during the water conservation period at Sugarloaf, and, conversely, the latter station providing its maximum output during the summer (irrigation) season, when the flow in the mountain streams is weakest. This is known as the Sugarloaf Hydro-Electric Scheme, and represents the auxiliary and most economical sections of the main Kiewa River scheme, to which reference has already been made. It will supply the electrical requirements of the north-eastern section of the State, while providing a surplus to meet the increasing metropolitan demand.

The mountain stream stations came into operation this winter, together with an additional 12,500-kW generator at the Yallourn station, so that the normal generating capacity of the State scheme is now 87,500 kW, which will provide a surplus of 4,500 kW over the estimated requirements of 1928.

Generally speaking, it is anticipated that the maximum demand on the State system will increase by 10,000 kW a year, and provision has been made for this anticipated increment up to and including the winter of 1930, as next year 15,000 kW will be installed at a power house at Richmond, Melbourne.

The Commission has now to lay its plans for a major extension of its supply system, to take care of the increment of load up to and including the winter of 1934, when it is expected that the maximum demand will approximate 150,000 kW. As being by far the most economical of all possible alternatives, it has submitted to the Government a proposal for the erection of a second power house at Yallourn, with an installed capacity of 75,000 kW, consisting of three units of 25,000 kW each, the first unit being designed to come into operation in the winter of 1931. This station will, of course, burn brown coal from the Yallourn open cut.

Coal-winning Costs.

Coincident with this proposal, and closely correlated thereto in its effect upon coal-winning costs, is the decision to increase the output of briquettes from about 400 tons a day to 1,200 tons a day, at a cost slightly more than that of the original outlay on the factory. This will place the factory on a commercial basis and ensure the manufacture of briquettes at a price which will command a ready sale—especially in the industrial market—of the whole of the trebled output.

At present the output of coal at Yallourn is 6,000 tons a day. The combined requirements of the extended briquetting factory and the two power stations will necessitate the output being increased to 10,000 tons a day in 1931. This large-scale production will be based on the use of the most modern dredging and electric transportation plant for the removal of overburden (about 33 feet) and the excavation of the coal. One dredge is already at work on overburden, and two—one a deep dredge and the other a scraper dredge—will be employed on the coal itself.

The economies to be effected on the larger output may be gauged from the fact that, whereas the cost of coal-winning is now 2s. 6d. per ton, it is confidently estimated that in 1931 coal will be delivered to both the power station and the briquetting factory at less than 2s. per ton. These economies, combined with the ever-

increasing load on the electric supply system, are rich in promise for the future progress and prosperity of the rational scheme, and, as the scheme does not exist for profit, considerable advantages will most certainly accrue to the users of electricity.

It would be very congenial to dwell upon Yallourn; to explore its vast potentialities; to explain the methods employed in turning to commercial account its wonderful deposits of brown coal, which, although containing up to 65 per cent. of moisture, are making Victoria every year more prosperous and self-contained in the matter of fuel supplies; and finally to take the reader in imagination over the model town which houses the Commission's officers and workmen on the field. Time will simply add to the fame of the field, and more and more vindicate the wisdom of its original selection as the basis of Victoria's national scheme of electricity supply.

Domestic Electrical Progress in Melbourne.

The author deals with the past success of the undertaking and forecasts a still more brilliant future.

By W. H. ALABASTER,
City Electrical Engineer, Melbourne.

THE City of Melbourne, with its 1,000,000 inhabitants, covers an area of approximately 270 square miles. The low density of population is due not only to the existence of wide roads, public parks and other open spaces, but also to the occupation of detached villas or bungalows by a very large section of the community. The absence of tenement dwellings, so common in many European cities, is a pleasing feature of the capital of the State of Victoria.

Notwithstanding the extent of the suburban areas, the use of overhead mains, instead of underground cables, permits the distribution of electrical energy at rates which are very attractive to the householder.

The Melbourne City Council generates a certain proportion of the energy it distributes in the central portion of the City, by means of its own plant, but with that exception, the thirteen distributing authorities in Melbourne obtain supplies in bulk from the distribution system of the State Electricity Commission, which also undertakes retail distribution in a few suburbs. The Melbourne Electric Supply Co. is also a large supplier as it distributes energy in over 100 square miles of factory and residential suburbs.

Although about 85 per cent. of the private houses in Melbourne are lighted electrically, the development of the domestic appliance load was slow until the commencement of 1925, when two-part tariffs were introduced by the Electricity Commission and the Melbourne City Council, in the districts under their control.

Towards the close of last year, the Electricity Commission convened a conference of the supply authorities concerned, and as a result of those deliberations, a two-part domestic light and power tariff of 1s. per month per active room, in addition to an energy charge of 1¼d. per unit, is now offered throughout the metropolitan area.

A tariff for continuous water heating of 3s. 9d. per month for every 100 watts of heating element capacity has also been standardised, and this has been responsible for great activity in the local manufacture and installation of water heaters, which are frequently fitted with boosting elements, to which energy is supplied at 1¼d. per unit from the general light and power installation in the dwelling.

Amongst the conditions which favour the future development of the domestic load in Melbourne are the following:—

(*a*) Supply of energy is available without any charge for servicing throughout the whole of the area.

(*b*) The weather in summer time is hot enough to cause housewives to appreciate cool kitchens, and to render the preservation of food very important.

(*c*) The high wages paid to female employés in shops and factories are responsible for a dearth of domestic help and many housewives, in comparatively comfortable circumstances, are obliged to undertake their own cooking and a good deal of their general housework.

(*d*) The fuel range with a water back is rarely found in the average residence, cooking in the majority of cases being done by means of a gas stove.

(*e*) At certain seasons in the year, the temperature changes rapidly, and the ease with which the clean electric radiator can be brought into service is a great convenience in the servantless house.

(*f*) Light meals, such as morning tea at about eleven o'clock and afternoon tea, are more regular features of the daily household round than in England. Australians consume a larger quantity of tea per head of population than the inhabitants of any other country in the world.

Kettles, toasters, waffle irons, percolators and other appliances for table cookery are eminently well suited to the preparation of such refreshments.

(*g*) The tariff under which electricity is now supplied for domestic use compares most favourably with the price of gas, which, in the central part of the City, is 7s. 1d. per 1,000 cubic feet.

The Melbourne City Council has maintained a showroom for some years past, in addition to conducting cooking demonstrations, and there is not the slightest doubt that these educational efforts have borne good fruit.

In December last, the State Electricity Commission opened its first showrooms in the metropolitan area, in the suburban districts of Essendon and Sunshine, and by arrangement with various trading houses who agreed to supply goods on consignment, commenced the sale of appliances on extended terms. This progressive action, in conjunction with the aforementioned introduction of two-part domestic light and power tariffs, has inaugurated a new era of electrical activity.

It seems probable that those supply authorities which as yet have no statutory powers to undertake the sale of electrical appliances may have to seek them in the near future.

Wiring.

As previously stated, the percentage of homes using electricity for lighting purposes is exceedingly high. For some years past, the growth of Melbourne has been almost phenomenal, and all new homes within reach of a supply authority's mains are lighted electrically, as a matter of course.

The importance of power points has not been properly appreciated hitherto by the small wiring contractors, who have undertaken the bulk of the work, and they have consequently failed to reap the rich harvest from the sale of portable appliances, which might otherwise have been in their hands before this.

Lighting.

The most marked defect in residential lighting is the indifferent illumination of the workshop of the home—the kitchen. In the majority of homes, the old-fashioned fly-spotted, clear lamp, with an ordinary conical shade, is regarded as good enough for the purpose.

The above remarks also apply to bedrooms, in many homes where such refinements as a counterweight fitting over the dressing table are rare.

In dining-rooms, lights are generally installed to light the room instead of the table.

Altogether, there is a big market for fittings awaiting development, and, unfortunately, many of the architects still include ridiculously inadequate prime cost amounts in their estimates, to cover such equipment.

Irons.

The iron is undoubtedly the most popular electrical domestic labour-saving appliance, and it is believed that it is in constant use by 90 per cent. of domestic consumers.

The Fire Underwriters' Association is anxious to minimise fire risks by legislation to prevent the use of irons which are not fitted with an automatic heat-cut-off, but the proposal is meeting with a good deal of opposition, mainly on account of the increased cost of the iron.

Toasters, Kettles, Fans, &c.

Small electrical heating and cooking devices, as well as fans, are sold not only by recognised electrical dealers but also by large general stores and, in the aggregate, they represent a very considerable addition to the connected load of supply authorities. Their use is very popular and they are undoubtedly paving the way for the still more valuable electric range load.

Vacuum Cleaners.

Vacuum cleaners are not manufactured in Australia, and about twelve months ago, that fact was successfully used as an argument to secure the removal of a Customs tariff of 27½ per cent. on the invoice value of these machines. The consequent reductions in prices have materially increased sales, but with comparatively little benefit to English firms, whose vacuum cleaners are neither well-known nor widely advertised here, with the exception of one well-known machine of British make which has been sold in large numbers by vigorous sales methods, including house-to-house canvassing.

No actual saturation figures are available, but there is good ground for the belief that 10 per cent. of consumers in Melbourne own vacuum cleaners.

Floor Polishers.

Polished hardwood floors and linoleums with rugs here and there are preferred to carpets by a large number of people, to whom the recent advent of a reliable and convenient household floor polisher is of great interest.

Two or three machines of this variety are now being sold in Melbourne, in addition to attachments for certain vacuum cleaners, for accomplishing the same purpose, and, although the number yet sold is small, the inquiries received indicate satisfactory future development.

Radiators.

Few suburban homes are without one or more electric radiators, but they are used occasionally in spring and autumn rather than as a regular means of room heating.

Lamp-type radiators have been displaced by those with cones in the centre of parabolic reflectors, which in turn are being superseded in many cases by the bar-type radiator.

This year, the sales of imitation coal fires have increased appreciably, but the high prices at which they are sold restrict the market for them. Some idea of that handicap may be gained from the knowledge that a well-known radiator sold in England for £7 7s. is retailed here at £13.

The bulk of the radiators used in Australia are made locally; one firm alone produces about 30,000 a year, and half-a-dozen smaller firms are engaged in the business. The competition is keen, and as radiators of the parabolic reflector type can be purchased from £1 upwards, there is no great field for the imported article, unless the latter embodies distinctive features of beauty or utility.

Commercial Radiators.

Whilst, strictly speaking, the use of radiators in office buildings is not covered by the title of this article, it is felt that the City Council's experience in this respect may be of interest to readers. Some five years ago energy for such radiators was supplied at 2d. per unit, but owing to their poor annual load factor (approx. 6 per cent.) it was decided to raise the rate to 3⅜d. per unit. Had this step not been taken there is no doubt that this load would have grown to such an extent as to have a very prejudicial effect upon the undertaking's costs, for, even at the present price, they are responsible for some 10,000-11,000 kW of peak loading at a price which does not cover the cost of giving the supply.

There is plenty of scope for the invention of a thermal storage system to be supplied at a restricted-hour rate, but the writer knows of none that is not altogether too heavy and cumbrous.

Water Heating.

The advantageous tariff under which electricity is now supplied for continuous water heating has given a tremendous impulse to this class of business.

Hot-water services, with a storage tank in the space under the roof, are usually installed in new homes of the better class, while in smaller dwellings, the lower capacity bath heater—usually 15 gallons—is preferred because it costs less. One local manufacturer alone claims that he is installing these heaters at the rate of 50 per month.

Whilst this class of loading is, of course, highly desirable, it is felt that better results still could be obtained with a hot-water storage system, supplied on a resricted-hour basis during, say, 10 hours of night time.

Electricity could be supplied at the rate of, say, ½d. per unit, provided the cost of a reliable time switch did not materially add to the total cost of the supply.

Water heaters of the so-called "instantaneous" type, with a demand of 12 kW and a load factor of less than 1 per cent., threatened to interfere seriously with the economics of suburban distribution, until the State Electricity Commission promulgated a regulation, in September, 1927, whereby no water heater with an individual demand in excess of 3 kW may be installed in a private residence.

Electric Ranges and Stoves.

Prior to the introduction of two-part tariffs, the cost of operating electric ranges was regarded as prohibitive by the great majority of suburban householders, but now that an economy can be effected in comparison with the cost of using gas stoves, progress is steady and encouraging.

The number of English and locally made stoves in use is greatly exceeded by those imported from Canada and from the United States.

Several substantial reasons can be advanced for the undoubted preference of the Australian consumer for stoves of the American type, and they include the following:—

(1) Easily cleaned ovens with rounded corners and removable fitments.
(2) Artistic and generally attractive design.
(3) Slightly lower cost for a given oven capacity.
(4) Wider and more effective advertisement.

Open-type boiling plates are still advocated by a few firms, but there is no doubt whatever that they will soon be completely displaced by those of the enclosed type, and at least one of the latter on any stove will have a capacity of 1,500 watts or more, to ensure quick results.

There is an increasing demand for small stoves with an element loading of 3 or 4 kW, and so-called breakfast cookers, for use in flats and homes occupied by two or three people only.

Refrigerators.

The ice chest is regarded as an essential item of household equipment, in a climate where a temperature of more than 100 deg. F. in the shade is often registered. The advantages of the more sanitary and convenient electrically operated refrigerator, and the elimination of the ice man, can therefore be demonstrated to prospects already convinced of the necessity for preserving food stuffs. Such arguments are well received, but the high cost of the equipment is as yet a deterrent to all but those in affluent circumstances.

Dishwashers.

When the dishwasher manufactured by the General Railway Signal Company, of Rochester, New York, was available, it caused a growing interest in machines for eliminating the unpleasantness of the continually recurrent task of washing china, glassware and cutlery, but since that firm ceased to manufacture the machine interest in the subject has waned.

The advent of a dishwasher of a similar pattern, which can be purchased for about £30, is awaited with interest by many people.

Clothes Washers.

In the servantless home, a strong desire to reduce the drudgery of washing day is in existence, and the firm which can place an efficient and attractively finished washing machine of the centrifugal drying type on the market here, at a price of under £30, can be assured of good sales. At present, clothes washers of that pattern vary in price between £40 and £55, and although a limited sale is steadily maintained, it is exceedingly difficult to persuade a customer that the acquisition of such a machine is a good investment.

Ironing Machines.

Although the volume of business in ironing machines is small so far, it is clearly evident that a great future exists for such an appliance in this country, if the price is reasonable.

Commercial Cooking.

There is quite a large field for cooking in hotels, restaurants, &c., and as this load is supplied by the Council under a sliding-scale power and heating tariff, the higher-priced units are generally absorbed by the lifts and other motors, and consequently the additional load (cooking) is supplied at the low rate of 0.8d. per unit. Quite a number of such installations are already in use and give complete satisfaction, and practically the only hindrance to a rapid extension of this business is the capital cost incurred in the displacement of the existing cooking means.

The foregoing comments upon the development of the domestic load would be incomplete without reference to the "All-Electrical Exhibition" held in Melbourne in September, 1927. It covered a floor space of 3½ acres, and undoubtedly did much to counteract the adverse effect of the present financial depression upon the electrical trade in general.

In the writer's opinion, the Exhibition, which was attended by over 200,000 people during the four weeks it was open, would have been regarded as a credit by any city in the Empire. A particularly pleasing feature of the display was the close co-operation between the trade and the three leading supply authorities in the metropolitan area, namely, the State Electricity Commission, the Melbourne City Council and the Melbourne Electric Supply Co., Ltd.

An endeavour has been made to show that a great deal of useful work has been accomplished in preparing the way for a development of the domestic load which, in the writer's opinion, will equal, if it does not eclipse, the importance of the industrial load before very many years have passed.

Domestic Electric Heating in Japan.

(*Abstract of a paper read before the* Fuel Conference of the World Power Conference.)

By VISCOUNT SHIMPEI GOTO.

THE development of the use of electricity in Japan has rather a brief history extending over only fifteen years or so. With the object of improving the conditions of the daily home life of the Japanese people, the Katei Denki Hukyûkai, a society whose aim is also to promote home electrification, was established in April, 1924, and the efforts of this society have resulted in a rapid increase during the past five years in the demand for electric heating. The electric heating appliances now commonly used in Japan are the *sitirin* (hot plate), the *kotatu* (body warmer), kettles, irons, radiators, toasters, percolators, milk warmers, cigar lighters, heating pads, curling irons and humidifiers; and the demand is gradually increasing for bath-water heaters, washing machines, cooking ranges, and refrigerators. There is at present a total power demand in the country of 130,000 kW for domestic heating by 82,000 consumers, or about 1.5 kW per consumer. The energy consumption per kW of demand varies from about 62 kWh for the summer to 92 kWh for the winter.

There are in Japan certain electric domestic appliances which are not found in other countries, having been devised to meet local customs and conditions. Among these may be mentioned an electric rice cooker which has been produced to take the place of the *kamado*. This appliance is usually loaded at from 1 to 3 kW, and it will serve for a family of up to about ten persons. It consists of a cast-iron cylindrical body with a heating element in the base; an aluminium container is placed in the body and over the element. The rice can be cooked in about twenty-five minutes. There are other special kinds of electric rice cookers. The *bannô sitirin* (or utility stove) is an interesting electric cooker which can be used for a variety of different purposes. It is essentially an electric oven with a reversible top heater which, when turned over, can be used as a hot plate. The cooker is made with loadings of 1, 1.5, and 2 kW. The Japanese bath is a square or round wooden tub, holding from 180 to 270 litres of water. The general practice is to heat the water in a boiler fired with coal or coke, but electrically-heated boilers are gradually replacing the fuel-heated ones. To heat the bath water, some people use a 2- to 5-kW immersion heater; others install a hot-water tank with a heat-insulating covering. Hot water is led to the tub from this tank. One or two 2-kW heaters are installed in the tank and can be used together or separately to regulate the heat.

Japan has many rivers with numerous high-water heads capable of producing over the period of normal water level a total of 14,090,000 h.p. water power, about 25 per cent. of which was being used for power generation at the end of 1926.

Electric Fires for the Home.

Representative Models for the Current Season.

THE progressive decrease in the charges for electricity for heating purposes, or for domestic use generally, has brought the electric fire within the reach of an increasing number of people. In a great many districts, indeed, electric heating now compares very favourably even in cost with other forms of heating. But apart from the employment of electric heaters as the sole means of warming the house, there is an immense scope for their supplementary or occasional use. The efforts of manufacturers of electric fires appear to have been directed more to the reduction of prices than to the production of new models, although this season's lists contain many new designs or improvements upon older patterns.

Fig. 1.—A "Met.-Vick." Utility Fire.

Fig. 2.—The "Felix" Fire.

Fig. 3.—A "Quead" Fire.

We have selected the following examples from the manufacturers' lists not always because they are new, but sometimes because they typify the makers' designs and are representative of the many different models that are available.

A useful alternative to the bowl fire for occasional heating or for use in small rooms is the "Utility" fire depicted in fig. 1. This is from the range of Metro-Vick Supplies, Ltd. It has a single 1-kW bar, and is of plain design with an oxidised copper finish. Similar models are made with two or three bars. Another "Met.-Vick" fire is shown in fig. 2. This is one of the well-known reflector heaters supplied by the company, the "Felix" model It includes all the outstanding features of the standard 1-kW reflector fire, but is given a more ornate finish in old silver.

A curb fire of handsome appearance is the "Quead" model "Q. 130," depicted in fig. 3. It is simple, ornamented and finished in black with a nickelled curb. The loading is either 2,000 or 3,000 W, and the elements are protected by a wire guard. The fire is 23 in. wide and 26 in. high.

Two handsome new "Magicoal" fires have been produced by Berry's Electric (1928), Ltd. Both of them are designed primarily for fitting in an existing fireplace. The "Slocom" (fig. 4) is constructed for slow-combustion openings ranging from 14 in. to 20 in. in the front. The heat is obtained from the trivet heater which stands in front of the fire. This heater is very efficient, being arranged with a large circular element, upon which there are three separate 1,000-W windings. A point about this fire is its low price. Fig. 5 shows the new register-type "Magicoal" fire. In this case also there is a circular 3,000-W heating element. The controlling switches are concealed behind the fret, which lifts up on a hinge.

Fig. 4.—The "Slocom" Fire.

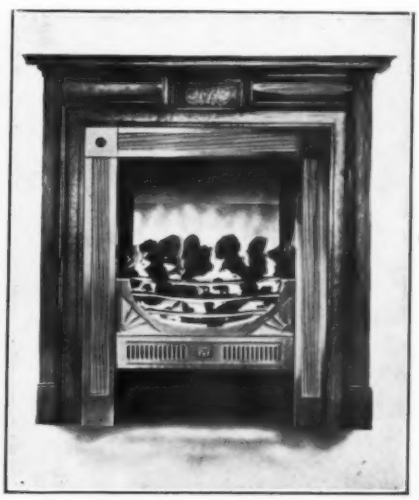


Fig. 5.—Register-Type "Magicoal" Fire.

The Arora Company, Loughborough, informs us that very radical changes have been made in its fires. Every model now listed has been modified in design, and the wiring arrangements have been improved so as to comply with the latest I.E.E. Regulations. The use of the bright, silvery-white metal has been considerably extended. This metal is brilliantly reflective, and will harmonise with any colour scheme of furnishing or decoration. An improved model is the "Rosebery" fire, illustrated in fig. 7. This is constructed of hand-finished brass castings and the best quality sheet metal. It is fitted with three or four 750-W bars, separately switched, and is produced in four finishes, *viz.*, polished brass, oxidised copper, oxidised silver, or bright silvery-white. The "Reflex" fire, shown in fig. 6, employs a

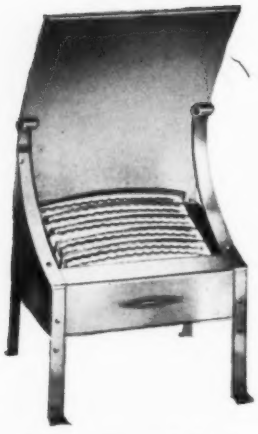


Fig. 6.—The "Reflex."

Fig. 7.—The "Rosebery."

Fig. 8.—An "Ediswan" Reflector Fire.

Fig. 9.—A "Jackson" Fire.

Fig. 10.—The "New Basketcoal" Fire.

Fig. 11.—A "Jackson" Dual-purpose Fire.

Fig. 12.—The "Teatime" Fire.

Fig. 13.—The "Norvic" Fire.

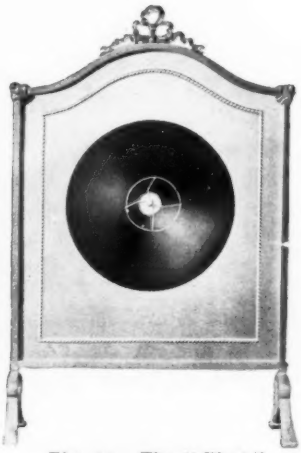


Fig. 14.—The "Elect" Screen Fire.

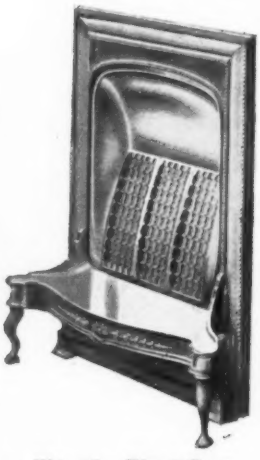


Fig. 15.—The "Type R.C.F." Fire.

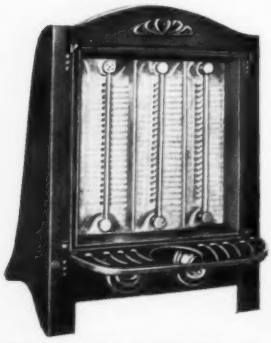


Fig. 16.—An "Inventum" Enamelled Fire.

Fig. 17.—A "Premier" Coal Fire.

Fig. 18.—A "Premier" Reflector Fire.

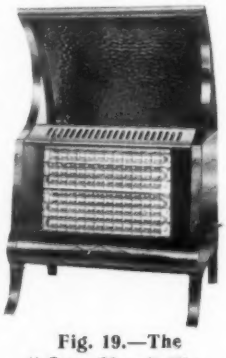


Fig. 19.—The "Cosy-Glow" Fire.

Fig. 20.—The "Borough" Fire.

Fig. 21.—A "Magnet" Sheet Metal Fire.

Fig. 22.—The "Alto-Model" Fire.

Fig. 23.—An "Angelus" Fire.

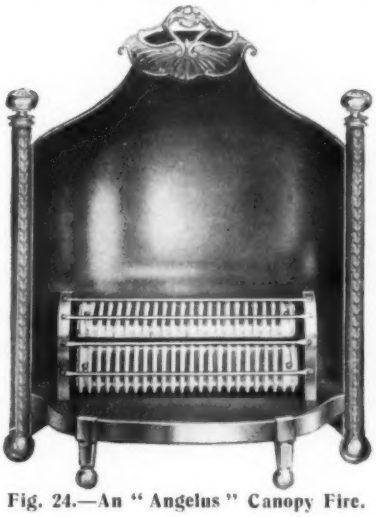


Fig. 24.—An "Angelus" Canopy Fire.

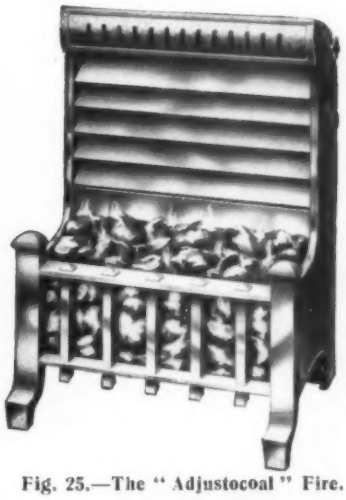


Fig. 25.—The "Adjustocoal" Fire.

Fig. 26.—The "Efescoal Mansion" Fire.

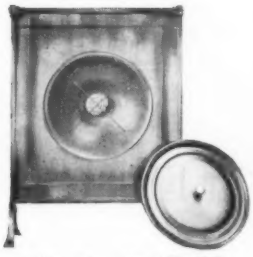


Fig. 27.—An "Xcel" Screen Fire.

Fig. 28.—The "Corporation" Fire.

Fig. 29.—The "Delphi" Fire.

Fig. 30.—The "Rose" Fire.

Fig. 31.—The "Silvern" Fire.

Fig. 32.—An "Empire" Fire.

new type of firebar developed by the company. It is of a honeycomb pattern, and is claimed to have remarkable radiating properties. The "Reflex" fire is made in only one finish—bright silvery-white, and has two 1,000-W bars, one of which is separately switched.

A range of sheet metal fires is supplied by the Edison Swan Electric Co., Ltd. These are constructed of pressed sheet iron with beaten ornamentation, and fitted with vertical bars. The top shelf is so arranged that small utensils can be placed on it for warming purposes. There are four sizes, 750 W, 1,500 W, 2,250 W, and 3,000 W. Three finishes are available — oxidised brass or copper and armour bright. Many models of reflector fires are supplied by the company. One of them, an Adams model, is shown in fig. 8. It is of distinctive and handsome design, finished in satin brass or oxidised silver and is particularly suitable for large hearths.

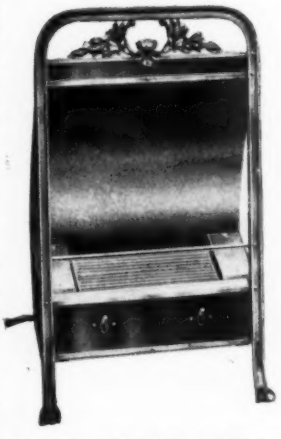


Fig. 33.—"Best-Ray" Fire.

Fig. 34.—A "Best" Jacobean Fire.

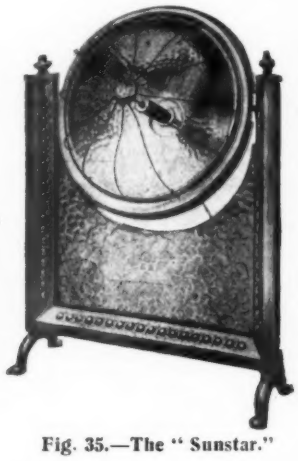


Fig. 35.—The "Sunstar."

Fig. 9 is typical of a series of fires made by the Jackson Electric Stove Co., Ltd., in which a special type of cylindrical plug-in element is employed in conjunction with a scientifically-designed channel reflector. The fire illustrated, as will be observed, has four of these elements mounted vertically, the total loading being 3,000 W, with three-heat control. It is roughly 25 in. high and 19 in. wide, and is available in antique brass, oxidised copper, or oxidised silver. Another Jackson fire is depicted in fig. 11. It is of the reflector type, with three 750-W bars and a stainless steel hob.

Among the fires described in the 1928-29 list of the Credenda Conduits Co., Ltd., is the "Adjustocoal" (fig. 25), which embodies what we believe to be an entirely new device. In this the heating elements (3,000 W) are concealed behind louvres which form the front, and can be set at any desired angle by means of a lever at the side of the fire. The heat can thus be directed upwards, downwards or horizontally as desired. In the front is a mass of imitation coal, and the body has an armour bright finish. In this, and in two other new models, a flue is provided in the back of the fire, arranged in such a way that a strong current of hot air is projected into the room, and a continuous circulation is provided. A more elaborate imitation-coal fire made by the company is shown in fig. 10. The imitation coal is in one piece, and the two firebars (1,500 W each) are arranged along the two-foot front of the fire. The finish of this fire is also armour bright.

Fig. 12 shows a useful dual-purpose fire made by Electric Fires, Ltd. It embodies three heating elements of 1,000-W each. Two of them are mounted in front for room-heating and the third is fitted in a special casing at the top for boiling purposes. Each bar is separately switched. The fire, known as the "Teatime" fire, is constructed of sheet steel; it has a black enamel finish with polished aluminium facings. The boiler top is of nickel-plated cast-iron. The "Norvic" fire (fig. 13), another "Heatrae" product, is of very substantial construction It has two or three solid porcelain-type bars, each loaded to 1,000 W. The finish can be either satin black with brass ornaments or antique brass with repoussé surface.

The Electric Heating Co., Croydon, has introduced two screen fires, one of which is illustrated in fig. 14. As will be seen, this is of handsome design; the ornamental surround is embossed in the sheet metal during the process of blanking. The fire is 19¼ in. high and 30¼ in. wide, and is produced in satin brass or oxidised copper or silver finishes. The other fire is less ornate, and cheaper.

A recent comer to the household appliance field is Domestic Electrification, Ltd., which was registered last year. One of this company's new designs is depicted in fig. 15; it is the "Type R.C.F." fire, which possesses certain novel points. It has three vertically-mounted concave bars with a total loading of 3 kW, and the bars are separately switched. They are mounted in a highly-polished reflector and enclosed in a cast-iron surround. An easily-replaceable sheet-iron back cover is fitted, allowing free access to the firebars or the connections for repairs or renewals. A separate fender is provided, the top of which is highly polished, giving a very pleasing effect. No fewer than ten colour and metal finishes are provided.

One of the principal innovations of Inventum Electrical Appliances, Ltd., is the chromium-plated re-

Fig. 36.—The "Rotunda" Fire.

Fig. 37.—The "Glowa" Fire.

Fig. 38.—The "Xcel Cosyglow" Fire.

flector; the company is prepared to fit these to the majority of its heaters at a slightly extra charge. "Inventum" fires are distinguished by their original reflector units. The reflectors are trough-shaped with a parabolic contour, and the concentrated heating coil is arranged to lie along the focal axis. Fig. 16 shows an "Inventum" cast-iron enamelled fire with a detachable trivet. It is fitted with three vertically-mounted units having a total loading of 1,500 or 2,100 W. The buyer has the choice of five colours—black, green, brown, white, or grey. A more elaborate fire made by the company is a sheet-metal model. This is equipped with four 500- or 700-W elements, and can be had in any one of six finishes.

A number of new imitation coal fires have been produced by Premier Electric Heaters, Ltd. The one illustrated in fig. 17 (which is typical of the range) has three 1,000-W bars—one mounted below the "coal," and the others at the base of the reflector. In this way practically all of the heat is projected forward horizontally. The fire is finished in antique copper or brass or oxidised silver. Fig. 18 shows one of the company's reflector-pattern fires—a very graceful model. This also has three 1,000-W bars arranged in curved formation at the foot of the reflector. The finishes available are the same as in the above-mentioned fire.

Several additions have been made to the "Magnet" range of fires produced by the General Electric Co., Ltd. The "Cosy-Glow" fire (fig 19) combines direct heating with a radiant effect. Two panel elements are mounted in the front of the fire, and there is a hammered copper reflector, at the base of which is a Robertson-type flame-coloured lamp. Two switches are provided, and the fire is given an antique brass or bronze finish. Another new "Magnet" fire is the sheet-metal model shown in fig. 21. This is a very artistic piece of work designed for semi-permanent fixing. It has a loading of 3,000-W controlled by two switches.

The Coventry Electrical Appliances, Ltd., are the makers of the "Corporation" fire illustrated in fig. 28. It is one of a series fitted with from one to four 1,000-W bars, and is finished in black enamel, brown or blue. Fig. 20 shows another model made by the same company—the "Borough" fire. This has a 1,000-W loading, and consists of a fire-bar fitted horizontally at the base of a hammered copper reflector. The framework has an oxidised copper finish. Both of these fires are eminently fitted for municipal hire schemes.

The "Alto-Model" fire (fig. 22) is the product of the Wholesale Fittings Co., Ltd. This is of plain design and constructed on utility lines. The elements are set in concave copper reflectors, and are protected by a strong wire guard; a two-year guarantee is given with them. A desirable feature of the fire from the user's point of view is that the elements can be easily removed without unfastening nuts or screws.

A number of new designs have been evolved by Messrs. Chas. Joyner & Co. The one shown in fig. 23 has quite a novel shape. It has a kind of archway front, and the back has a chordal line. The reflector is of hammered copper and reflects the rays of a tubular element bar, which has two "heats," each of 1,000 W. Another new design is that shown in fig. 24. This is a handsome 2,500-W canopy fire with a polished stainless steel back and pillars finished in old brass.

Fig. 26 illustrates one of the many "Efescoal" fires produced by Messrs. Falk, Stadelmann & Co., Ltd. It is known as the "Mansion" model and measures 21 in. in height and 18 in. in width. Two 1,125-W firebars are fitted, each being on a separate switch. The finishes available are old brass and oxidised copper.

Siemens Electric Lamp & Supplies, Ltd., is marketing a number of new and improved "Xcel" appliances, including the two fires illustrated in figs. 27 and 38 The first is a screen model, consisting of a 27 in. by 20 in. screen mounting a bowl fire, fitted with a 600-W or 1,000-W coiled element. A cover is provided for the bowl opening when the fire is not in use. Antique brass, oxidised copper, and oxidised silver finishes are supplied. Fig. 38 depicts the "Cosyglow" fire supplied by the company. This is a fire of handsome appearance, in which the imitation coal is provided with a realistic smoke and flicker effect.

A range of four new imitation coal fires have been placed on the market by the Electric Heating and Hardware, Ltd., known as the "Boomeranglo" series. One of these, the "Delphi," is illustrated in fig. 29. These fires, before leaving the works, are fitted with a patented "coal" container or carton. This is placed in position in the front of the fire, flat spring clips engaging with a stop on the inside of the fire. The fire illustrated has a total loading of 3,000 W reducible to 2,250 W. The standard finish is copper bronze, but other finishes can be provided. The company has also produced a 1,000-W fire on similar lines.

There is novelty in the "Rose" fire made by Electrical Utilities, Ltd., and illustrated in fig. 30. The fire is triangular in plan, and in each side a 1,000-W element is fitted with a separate switch. The framework is of cast-iron finished in oxidised copper or ruby-coloured vitreous enamel, giving the appliance a pleasing appearance. The fire illustrated is equipped with nichrome-wire, mica-supported elements, but bars of the "Heetrod" silicon type can be supplied.

The bowl fire illustrated in fig. 31 is of rather original design. It is the "Silvern," supplied by the Hotpoint Electric Appliance Co., Ltd. The polished copper bowl is 9 in. in diameter and houses a 500-W coiled element. The outer ring is simply ornamented, and the base, which is of unorthodox shape, provides a firm foundation. The fire is enamelled in various colours or provided with a metallic finish. The "Empire" imitation-coal model (fig. 32) is one of a range of "period" designs, each of which is equipped with two firebars having a loading of 2,000 W. A glow and flicker effect is obtained in the coal by means of an amber lamp. The standard finish is art black, but armour bright and electro brass or copper finishes are also obtainable.

In a recent issue (Sept. 28th) we dealt with the evolution of an electric fire at the works of Messrs. Best and Lloyd, Ltd. One development of the design then described is the Adam "Best-Ray" fire illustrated in fig. 33. This possesses simple, handsome lines, relieved by a little ornamentation at the top. The reflector is of polished copper, and there are two 1,000-W elements. Three finishes are available, *viz.*, Venetian bronze combined with either oxidised brass, copper or silver. Another "Best" fire is the Jacobean 2,000-W model depicted in fig. 34. This has cast-iron sides and a sheet-metal body finished in Venetian bronze or oxidised brass or copper.

The "Sunstar" fire (fig. 35) is a novel screen model. A 14-in. bowl fire with a hammered copper reflector and a 1,000-W element is mounted in a handsome screen finished in antique copper and decorated. The makers are the Revo Electric Co., Ltd.

At their works at Enfield, Messrs. Belling & Co. have their own foundry, vitreous-enamelling plant, finishing plant, &c., and are now making their own fireclay bases for elements. Their 1928-29 catalogue contains particulars of a number of new designs, two of which are illustrated herewith. Fig. 36 shows the "Rotunda" fire, whose name is descriptive of its nature. The front part and firebars are semi-circular, distributing the heat over a wide area. The firebars, three in number, each have a loading of 1,000 W. The back above the dome is ventilated to cause the circulation of the warmed air. A bronze finish is provided.

Messrs. H. W. Sullivan, Ltd., have produced two excellent lists of their fires. In addition to attractive cover designs, many of the illustrations are produced in metallic colours, which shows exactly what the fires look like. The colours include antique copper, antique silver, and antique brass. A Sullivan fire on somewhat unusual lines is the "Glowa" (fig. 37). In the front of this are fitted two 1,000-W "Uniglow" elements, while at the top is a mass of imitation glowing coals illuminated by an electric lamp.

Electric Cooking.

A review of recent developments in the design and construction of domestic electric cooking equipment.

IN a similar article to this in our Domestic Electrification Issue last year we commented on the slowing-up in the introduction of radical changes in the construction of electric cookers during the previous year, and suggested that, rather than a state of stalemate, the lull after the rush to produce new designs meant that the time for the stabilisation of the existing cooker designs had come. That impression has been confirmed by the developments during the past year. Generally, the standard design of electric cooker is completely satisfactory where suitable tariffs are offered. It may be argued that the boiling plate is still a weak point, but, although as a quick-boiling unit it is certainly not ideal, where the electric kettle is included as an essential part of the cooker, the requirements of the cook or housewife are met efficiently and with many advantages over other methods of cooking.

Fig. 1.—"Magnet" Cooker—Two Plates.

Fig. 2.—"Magnet" Table Cooker.

The manufacturers are still concentrating on improving the details of the established designs, and the following information concerning the products of various companies will, we hope, be of interest and assistance to our readers.

Fig. 3.—"Hotpoint" Table Cooker.

Fig. 4.—"Jackson" Model No. 58.

Fig. 5.—"Xcel" H.4135 Cooker.

The range of "Magnet" electric cookers manufactured by the General Electric Co., Ltd., is being extended by the inclusion of several new models for the 1928-9 season. These, as regards the electrical materials, are designed and arranged with a view to minimum maintenance costs. The elements are made easily accessible, and totally-enclosed quick-boiling plates and reciprocating three-heat switches controlling the circuits are features of the design. Wherever possible the wiring is concentrated at the sides of the cooker, an arrangement which serves the double purpose of rendering every circuit easy of access and allowing the provision under the hob of a warming cupboard of liberal dimensions. Replaceable units, such as hotplates, are connected by means of thumb-screw terminals. Efficient earthing facilities are provided close to the main terminals, and care is taken to ensure good continuity throughout the entire frame of each cooker. Plugs and sockets, where fitted, conform to British Standard Specifications, and are of the three-pin earthing type. The corners are everywhere rounded to facilitate cleaning, and in most cases the oven interiors are completely withdrawable. Two among the models represent, it is claimed, the only all-pressed-steel electric cookers manufactured in England. Figs. 1 and 2 show, respectively, a small "Magnet" cooker of the ordinary type, with two boiling plates, and a table cooker with three plates.

Several new cookers have been recently introduced by the Hotpoint Electric Appliance Co., Ltd. One of these is the table model cooker shown in fig. 3. This is a compact model suitable for a household of 6-7 persons. The oven has side and bottom standard heating elements, and a special refractory-type element is fitted on the inside top of the oven for grilling purposes: this is also useful for speeding up the pre-heating of the oven when required for roasting, baking, and so on. The hob is equipped with three totally-enclosed circular boiling plates, and the cooker may be obtained in various finishes. Other models recently introduced are specially constructed for hiring and housing schemes. All the cookers now supplied by this company are fitted with one-piece removable-type oven interiors, having rounded corners and round wire runners.

From the extensive range of apparatus produced by the Jackson Electric Stove Co., Ltd., we have selected the following. No. 58 cooker, fig. 4, has overall dimensions of 28 in. wide, 21 in. deep, and 38 in. high. The oven cooking space is 15 in. wide,

17 in. deep, and 19 in. high. The hob is fitted with two boiling plates, each measuring 8 in. by 6 in. and loaded at 1,500 W, one boiling plate measuring 8 in. by 7½ in. and loaded at 1,800 W, and one grill measuring 11 in. by 8 in. and loaded at 1,800 W. The total loading of the oven elements is 2,750 W. No. 56 Jackson cooker, fig. 10, has an all-enamelled mottled finish. It is constructed of cast-iron and steel-plate, and its design combines lightness and strength. The oven has ample cooking space for ten persons, and is loaded so as to attain a cooking temperature in about 20 min. from switching on. The oven interior is of steel-plate, with well-rounded corners. The bottom is fitted flush to the cast-iron front frame so as to ensure easy cleaning. The oven is double cased and efficiently lagged. The elements are arranged at the sides and "side-bottom" of the oven, and are mounted on frames secured by grooved pins fixed on the oven sides. By means of wing-nuts the frames are easily removable. The hob is fitted with two 8½-in. by 6-in. boiling plates which are of the makers' fully-protected free spiral pattern. The overall dimensions of the cooker are 36 in. high by 26 in. wide by 22 in. deep. The oven cooking space is 15 in. by 13 in. by 15 in. The loadings are as follows:—Boiling plates, 1,500 W each; grill, 1,800 W; oven, 1,950 W.

A cooker selected from the 1928-29 models of Siemens Electric Lamps and Supplies, Ltd., is the H.4135 model shown in fig. 5. This is a good average-size cooker specially designed for hiring schemes. It is fitted with two boiling plates and a grill. The overall dimensions are 36 in. by 20 in. by 24½ in., and the oven cooking space is 14 in. by 13½ in. by 13 in. Side heating is provided for the oven, and the loading of the elements is 1,600 W. Two circular boiling plates and a grill are provided. One plate has a loading of 1,700 W and the other 1,500 W; both are 7 in. in diameter. The grill measures 10 in. by 8 in., and has a loading of 1,500 W. The cooker is supplied with a standard finish of stove black, with a glazed and polished hobplate and a white porcelain-enamelled oven doorplate.

The products of newcomers are always looked forward to, and the following particulars of the medium-sized cooker produced by Domestic Electrification, Ltd., will no doubt prove of unusual interest. The cooker, fig. 6, comprises an oven and enamelled inside and out. The heating elements are fitted with standard plug-in contacts and attached to the shelf supports or runners, forming two complete units; this arrangement facilitates their instantaneous removal for cleaning or inspection purposes,

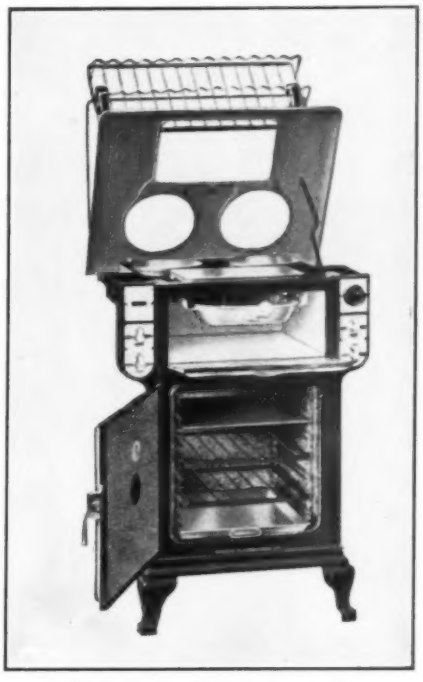


Fig. 6.—"Domestic Electrification" Medium Cooker.

and after the withdrawal of the combination units a smooth, even surface remains. Special care has been taken to reduce heat losses to a minimum by lagging the oven and door with an extra wide partition packed with non-conducting material. The oven door latch is of an entirely new design, easy to operate, which ensures a perfectly tight-fitting door. The hob is hinged, and can be easily lifted for inspection pur-

Fig. 7.—Small "Ediswan" Model.

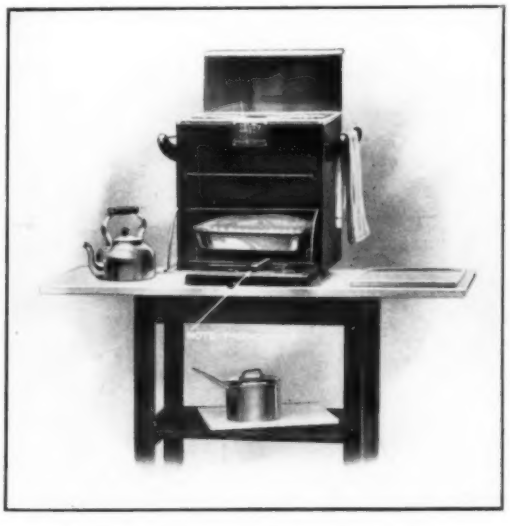


Fig. 8.—"Savex Dominion" Cooker.

Fig. 9.—The "Housewife" Cooker.

hot closet surmounted by a hob containing two 8-in. circular, enclosed-type boiling plates and a grill. The framework of the cooker is constructed of cast-iron. The oven is built of stout sheet-iron, and has rounded corners; the top, sides, and bottom are flush with the cast-iron frame at the door opening, and are porcelain-

poses. A specially-designed hotplate support frame which carries the boiling plates and the grill is provided to prevent any liquids which may boil over on to the hotplate coming into contact with the plugs or wiring connections. The grill is fitted with standard plug-in contacts and is 3-heat controlled. When in use for

grilling purposes, the top may also be used for boiling or as a girdle plate for the baking of scones. The hot closet is of large dimensions.

The Edison Swan Electric Co., Ltd., has introduced several improvements, some of which are represented in the small cooker shown in fig. 7. This has been designed to meet the increasing demand for a small model suitable for use in bungalows, flats, or small houses, where space is limited. It is constructed from specially-selected sheet-steel, and is finished in black enamel, with a nickel-plated top plate, polished round mouldings, and a white enamelled plate on the door. The front legs are of tubular section, nickel-plated and polished. The oven is fitted with a removable single-unit lining, with all the corners rounded, and is cased and effectively lagged. The grill is situated in the centre of the top element of the oven. The boiling plates are of the tubular type, the tubes being cast integral with the plate.

Fig. 10.—All-enamelled "Jackson" Model.

Fig. 11.—"Everlasta" Table Oven.

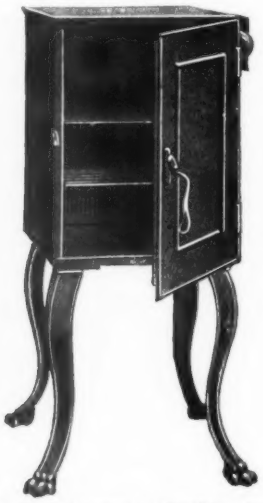


Fig. 12.—"Arora" Electric Oven.

Fig. 13.—"Elect-Maisie" Cooker.

Fig. 14.—"Creda" Double-oven Range.

An interesting introduction by Messrs. Coley and Swinnerton, Ltd., is the "Savex Dominion" cooker, shown in fig. 8. This is of the makers' standard size, inside measurements 11½ in. × 14 in. × 13½ in., and it has top and bottom protected elements. An additional rack is fitted for grilling purposes. The two boiling rings are 7½ in. in diameter, and each is provided with three-heat rotary reciprocating switches. The top of the cooker readily lifts up, so as to render the plug-in elements accessible. The covers are solid and flush, while the oven top is enamelled white or mottled-grey. Two towel rails are provided at the sides. The oven is equipped with baking and grilling pans, trays, and a thermometer. Where preferred, a metal stand is supplied suitable for bolting to the floor and wall. The boiling rings are loaded at 800 W each, and the oven at 1,000 W.

There seems to be an increasing demand for the lighter types of cookers, and several makers have made efforts to meet this demand, resulting in cookers which are much less expensive, take up less space, and are to some degree portable. Such a model is the "Housewife" cooker, fig. 9, marketed by Electric Fires, Ltd. It is supplied complete with a stand which brings the hob to a convenient working height. The two closed boiling rings are each controlled by an independent 3-heat switch. The oven has top and bottom elements, also 3-heat controlled. The total loading of the cooker is 3 kW. The internal dimensions of the oven are 13 in. by 12 in. by 12 in. deep.

There is also a call for the purely electric oven without the other parts which make up the ordinary cooker. An example is the "Everlasta" table oven, fig. 11, sold by Messrs. H. W. Sullivan, Ltd. This is fitted with eight "Uniglow" elements controlled by 3-heat rotary-type switches, and the top and bottom elements will consume ¼, ½, or 1 kWh per hour, respectively. The oven dimensions are 18 in. by 12 in. by 13 in., and the overall dimensions of the apparatus are 30 in. high, 24 in. wide, and 18 in. deep.

Another example, but smaller, is the electric oven

made by the Arora Co., fig. 12. This has double walls of sheet iron, with air lagging. The illustration shows it mounted on 15-in. legs. The regulating switch on the side of the oven has an indicating disk

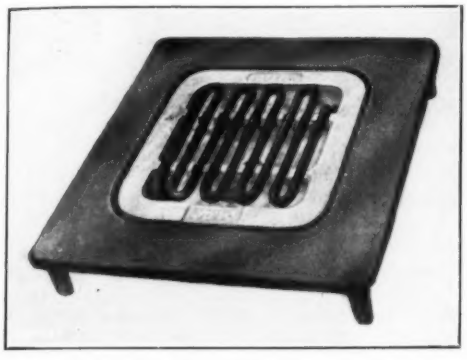


Fig. 15.—Revo "Superspeed" Boiling Plate.

showing the "off," "high," "medium," and "low" positions. The loadings are: high, 1,800 W; medium, 750 W; and low, 450 W. The oven external dimensions are 17 in. by 13 in. by 14 in. deep.

A departure from the usual design of electric cooker is represented by the "Elect-Maisie" cooker, fig. 13, produced by the Electric Heating Co. The oven attains, it is claimed, a temperature of 350 deg. F. in 15 min., with practically no loss of heat. The elements are, unless specified, of the open type, but the enclosed type can be fitted, if desired, for a slightly additional cost. The oven is provided with a mica window through which the elements can be seen. Special care has been taken to make all the elements accessible, and replacements can be effected without the aid of a mechanic, as the construction allows every element to be withdrawn without dismantling the cooker. The model is equipped with two boiler rings and one griller. The overall dimensions of the apparatus are 27 in. long by 15 in. deep by 26 in. high. The loadings are: oven, 2 kW; boiling rings, 1 kW each; grill, 1 kW.

The double-oven range shown in fig. 14, a product of the Credenda Conduits Co., Ltd., is perhaps border-

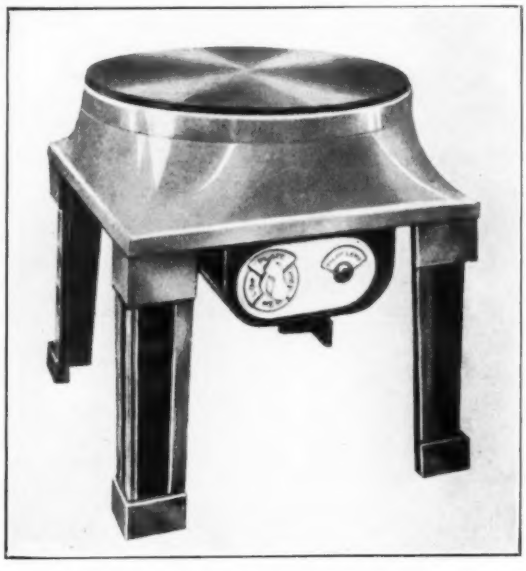


Fig. 17.—"Revo" Stock-pot Heater.

ing on the class of apparatus for industrial work, but there is no doubt a domestic field for such apparatus, particularly where bread is made for large families. This range consists of two standard ovens, with a cooking space in each, 18 in. high by 16 in. wide by 16 in. deep. The oven interiors are removable in one piece for cleaning, and are finished in grey mottled vitreous enamel. The oven heat is from the sides and bottom. Two grills, each 10 in. by 10 in., are supplied under the hob. The hob also accommodates two large boiling plates, 14 in. by 8 in., each controlled by two three-heat switches, and two smaller plates, 8 in. by 8 in. The wiring of each half of the range is separate, and the main terminals for each half are contained in the switch boxes at either end of the range. All the switches are of the three-heat type, and s.p. fuses to each circuit are located in the switch boxes. The loading of each oven is 3 kW; the two grills are each loaded at 1.5 kW, the large boiling plates at 3.6 kW and the smaller ones at 1.0 kW.

An interesting development of the Revo Electric Co., Ltd., is the "Superspeed" indestructible boiling plate. This is shown in fig. 15 as a separate unit, but the apparatus has been embodied in the design of ordinary cookers. The plate, it is claimed, combines the advantages of the open-type plate with the attributes of the enclosed pattern. A 0.2-in. diameter resistor, wound in concentrated grid formation and held in a suitable

Fig. 16.—"Heetrod" Table Cooker.

refractory base is energised at 10 V from a suitable transformer. The full load of 2 kW is reducible by tappings on the transformer primary to 800 and 300 W. The natural oxide of the wire prevents short circuits, even though the utensil be brought into contact with the glowing resistor. "Earths" are eliminated by virtue of the double winding of the transformer, and open circuits are not possible owing to the heavy gauge of the element.

Electric cooking apparatus, of course, includes all manner of small-type appliances—combination boiling plate-grillers, toasters, kettles, and so on. With regard to the boiling plate-griller type of apparatus, it is really surprising to what uses it can be put, and cases are reported of such apparatus being used for a whole family's requirements. The "Heetrod" cooker shown in fig. 16 is an example of such appliances. It is a product of Electrical Utilities, Ltd. It employs the "Heetrod" solid composition elements, which are rated to run at about 1,700 deg. F. (bright red heat). They are unaffected, it is claimed, by the spilling of liquids, short-circuits, and the other usual causes of breakdown, and they are easy to replace.

Fig. 17 illustrates an electric stock-pot heater produced by the Revo Electric Co., Ltd. It is constructed of a cast-iron porcelain enamelled frame supporting a totally-enclosed boiling plate 15¾ in. in diameter. Four stout cast-iron legs with bright mouldings carry the porcelain-enamelled surround. A conveniently placed box below the surround accommodates a 3-heat rotary switch, pilot lamp, and d.p. fuses.

Electric Water Heating.

Selections from the New and Improved Apparatus at present on the Market.

THE one domestic electric service which still "lags" is that of water heating. That this is not due to difficulty in design or lack of enterprise on the part of the manufacturers is evidenced by the following particulars of equipment of various makes. The stumbling-block is the old supply prob

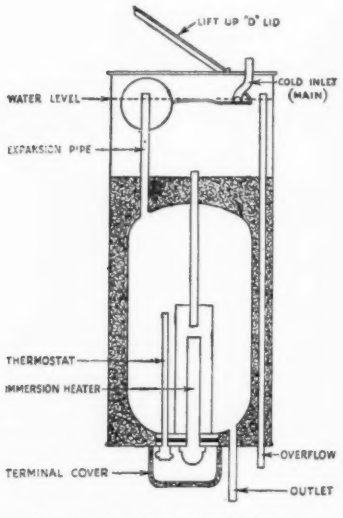


Fig. 1.—Section of "Jackson" Storage Heater.

Fig. 2.—"Jackson" Quick-operation Heater.

lem of tariffs, and although in many districts rates have been adopted which are favourable to water heating and business is going ahead, generally, domestic electric water heating is not yet a commercial proposition. It is to be regretted that a simple tariff for water heating supply has not yet been found which is agreeable to all supply men, and that in itself is a decided hold-up to progress.

The variety of the equipment offered by the type and complete domestic hot-water supply tanks. The "Hotpoint" local storage heater has a single-cased copper container fitted with a 2-kW heater controlled by a 3-heat switch. The model is being taken up by local authorities for installing on housing estates. The range also includes several pressure tanks which are double copper jacketed and provided with highly efficient heat insulation. These are fitted with 2-kW immersion heaters and controlled by mercury-type automatic switches. Fig. 3 shows a pressure-type water heater introduced by this firm. It is recommended for use where hot water has to be drawn off at two, three, or four different points. The cylinder is constructed of hand-rolled copper, the inside of which is heavily tinned and lagged with a layer of high-grade heat-insulating material. The apparatus is made in sizes varying in capacity from 20 gal. to 4 gal. and loadings from 1,000 to 4,000 W.

Two ranges of water heaters recently introduced by the Jackson Electric Stove Co., Ltd., are represented by figs. 1 and 2. Fig. 1 is a sectional diagram of a heater selected from a range of storage apparatus supplied with ball-valve tanks. The operation is self-explanatory. The models vary in size, with capacities from 2½ to 25 gal. and loadings from 500 to 1,500 W. The second range, fig. 2, embodies higher-loaded apparatus for quick operation. The models vary from 5 to 20 gal. in capacity, with loadings from 2,500 to 5,000 W.

The Bastian Meter Co., Ltd., has made considerable improvements in its new 1928 model storage geyser, fig. 4. The lagging has been increased and the specially-designed heating elements are completely immersed in the water. The finish is in white enamel. The cold water enters slowly at a rate proportional to the heat available, and is immediately heated to the same temperature as that already in store, with the result that no matter how much or how little is drawn off, the water remaining is always hot. The apparatus is supplied with capacities varying from 10 to 40 gal. and constant-heat loadings from 100 to 600 W.

Fig. 3.—"Hotpoint" Pressure-type Heater.

Fig. 4.—"Bastian" Storage Geyser.

Fig. 5.—"Magnet" General-supply Apparatus.

Hotpoint Electric Appliance Co., Ltd., provides a solution to practically any problem that may present itself. The apparatus is robust, efficient in use and, it is claimed, practically indestructible. The range includes handbasin and bath-water heaters, local storage-

The General Electric Co., Ltd., manufactures a range of "Magnet" water heaters for both local and general supply purposes. For local supply purposes apparatus has been designed for providing a supply of hot water at one position only. Two sizes are avail-

able, *viz.*, one of 15 gal. capacity, suitable for installation where a bath-water supply is desired, and a 6-gal. size suitable for a supply to individual hand basins or kitchen sinks. The current is automatically controlled by a thermostat which is set to operate at 180 deg. F., but can be supplied for other fixed temperatures below 200 deg. F. if desired. Standard withdrawable-pattern immersion heaters are fitted in each of these two models.

The "Magnet" electric water heater illustrated in fig. 5 is designed as a general-supply apparatus. It has a storage cylinder which is double cased and heavily heat insulated by a special method to effect economy in operating cost. The inner cylinder is tested to 25 lb. per sq. in., and is available either in galvanised mild-steel or tinned-copper. The apparatus is thermostatically controlled, the thermostat being adjustable between 140 deg. F. and 200 deg. F. The heating element is a "Magnet" withdrawable 2-kW immersion heater. The G.E.C. apparatus also includes an electric geyser, fig. 10, which has been designed primarily for use where small quantities of hot water are required by merely turning on the tap. The water and electric

Fig. 7.—R.O.U. Bath-Water Heater.

Fig. 8.—"Gee-Gee" "Delta" Automatic Heater.

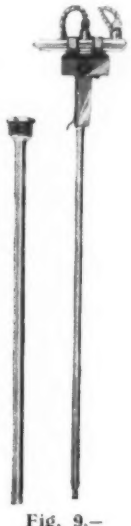


Fig. 9.—"Gee-Gee" Temperature Switch.

controls are directly interlocked and arranged to operate simultaneously from one lever handle. A special reducing or check valve is fitted for regulating the flow of water, and the heating unit is the makers' standard immersion heater. With incoming water at 50 deg. F. a continuous flow of boiling water at the rate of about 1 pint per min is obtained.

From a fairly wide range of water-heating apparatus manufactured by Electric Fires, Ltd., we have selected the type R.O.U. bath-water heater, fig. 7, as of outstanding interest. The tank of this apparatus has a permanently open outlet, the control being by a valve provided on the cold-water inlet. The tank is always full of water and operates on the displacement system. The cold water discharges into a funnel at the top of the tank, whence it is led by a pipe to the bottom. The adjustable discharge spout at the bottom of the tank is connected to a pipe rising to the top. This pipe is fitted with an anti-drip device which prevents dripping from the spout during heating up. This method of filling meets all water companies' requirements and enables the water connection to be taken direct from the main. The apparatus is unlagged and is intended for switching on occasionally as baths are required. The time taken to heat up for a normal bath is about 45 min. After this period the switch is put "off," the cold-water inlet valve is opened, and hot water flows out into the bath. The equipment is made in three sizes—5-, 10-, and 15-gal.—and a standard loading of 4 kW is employed, but lower loadings may be used if required.

An interesting apparatus produced by Messrs. George Green & Co. is the "Gee-Gee" "Delta" automatic water heater, fig. 8. This is designed in one unit to fulfil the demand for both local and central storage. It has two hot-water outlets, one at the top and one at the bottom, the former being plugged off when the tank is used for local storage. The internal container is constructed of copper, tinned inside and tested under pressure. This is surrounded

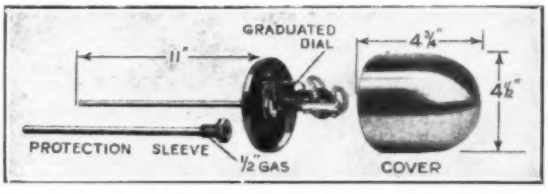


Fig. 6.—"Genii Maclaren" Thermostat Switch.

by a thick layer of specially prepared heat-insulating material, which is held in place by a galvanised-iron container. There is no metallic connection between the inner and outer cases. A nickel-plated inlet valve and outlet spout are supplied with each heater, but these fittings are not required when used for "central" storage. The heater is made in four sizes of 1.5, 4.5, 12 and 18 gal. capacity, with loadings varying from 250 to 1,000 W. The operation is controlled by a specially-designed automatic temperature switch.

A particularly important part of modern water-heating equipment is the control and switching apparatus. Fig. 9 shows the "Gee-Gee" temperature switch made by Messrs. Green. This combines a s.p. mercury switch and a highly sensitive thermostat. It is made in two parts, a protecting tube which is fitted to the vessel, and the thermostat proper, which is pushed into the tube and held by a spring clip. The switch is suitable for regulating the temperature of liquids and air, and it can be adjusted between 50 and 200 deg. F. It will operate on a minimum temperature difference of 10 deg. F. The apparatus is suitable for a.c. or d.c. supply, and by a simple adjustment may be instantly adapted for either horizontal or vertical mounting.

Another thermostat switch specially designed for domestic electric water-heating apparatus is the "Genii Maclaren," fig. 6, recently introduced by Messrs. George Nobbs, Ltd. This consists essentially of an expanding metal sleeve, a s.p. mercury-tube switch with thumbscrew adjustment, and a graduated dial, all mounted together as one unit and fitted with

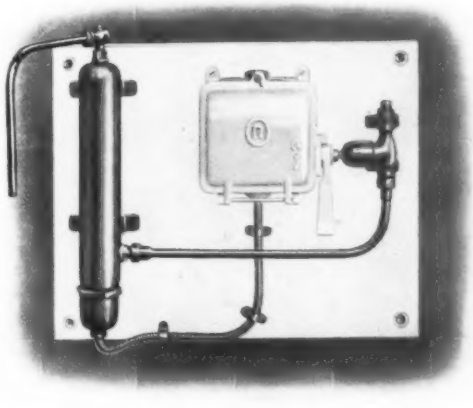


Fig. 10.—"Magnet" Geyser.

a spring clip to hold it in position with the sleeve in a protection tube, and also to enable the thermostat to be inserted or withdrawn instantly without drawing off any water. The apparatus is fitted with an adjustable temperature regulator graduated from 100 to 200 deg. F

Electric Lighting Fittings.

A Selection of Typical Designs.

AMONG the hundreds of applications of electricity, lighting is still pre-eminent. The efficiency, adaptability, convenience and cleanliness of electric lighting places it far in front of its nearest rival. It is still true, unfortunately, that in spite of its acknowledged supremacy, it is badly handicapped by incorrect treatment. Even among industrial establishments, where the proper use of light should be understood, the organisers of the Factory and Workshop Lighting Campaign found that the large majority had very little idea of the possibilities and economies of correct illumination. In the home, of course, the position is worse; people are not yet aware that efficient and artistic fittings are available at all prices, and still cling to the most primitive and ugly methods. It is a part of the electrical contractor's duty to relieve this ignorance, and to this end he can call in the assistance of many manufacturers of lighting fittings, some of whom are represented in the following illustrated notes upon the new season's designs.

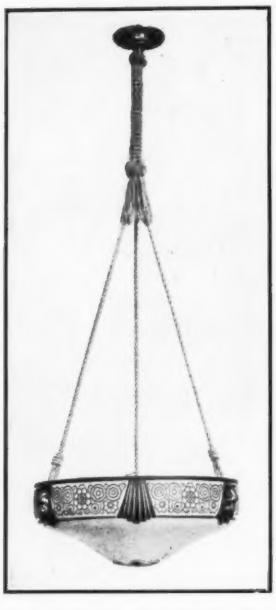


Fig. 1.—A G.E.C. Bowl Fitting.

Fig. 2.—A G.E.C. Hall Pendant.

Fig. 3.—An "Ediswan" Bowl Fitting.

The General Electric Co., Ltd., is paying special attention at the present time to the needs of the average household, although it still caters for the buyers of the more exclusive and expensive fittings. Thus it is that the bulk of the company's new designs are of the lower-priced type; they are not, however, "cheap" in the other sense of the word, as the examples illustrated will prove. A pleasing feature of many of the new season's lighting fittings lies in the use of silk-rope suspension cords instead of the usual chains, which are prone to throw grotesque shadows on walls and ceilings. These silk rope suspension cords are procurable in different colours for harmonising with various furnishing schemes. Antique brass or bronze are the prevailing finishes, and this, coupled with high-class "Bakelite" accessories in oak and mahogany finish, will remove much of the difficulty of keeping fittings clean. Fig. 1 shows a semi-indirect silk-cord suspension pendant unit. The bowl, which is 14 in. in diameter, has brown decorative ornamentation, and the cord and metal parts are in old gold or silver-grey. The total length from the ceiling to the base of the bowl is 36 in. The other G.E.C. fitting illustrated (fig. 2) is a totally-enclosed hall pendant. The glassware, which is of pleasing shape, is black and white mottled giving a diffused light. The metalwork has an antique brass finish.

Fig. 4.—An "Ediswan" Table Standard.

Fig. 5.—An All-glass Lantern.

Fig. 6.—A Flaked-white "Altolite" Bowl.

Fig. 7.—A Hanging Cupid Fitting.

Among the many designs which appear in the decorative fixtures catalogue of the Edison Swan Electric Co., Ltd., are those shown in figs. 3 and 4. The first is a bowl fitting which is produced in three sizes ranging from 12 in. to 16 in. in diameter, with or without the centre body and top chain as illustrated. The metalwork is antique brass and the bowls are of English cased opal of a pleasing contour. Fig. 4 shows one of the company's table standards. This is of cast brass, with an antique finish, about 11 in. high, fitted with a white-lined silk shade 9 in. in diameter.

A number of novelties are introduced by Messrs. Richson & Co. (1925), Ltd. The lantern shown in fig. 5 is not the antique wrought-iron bound fitting which it seems to be. It is actually made in one piece of glass and will withstand the weather. It is naturally much cheaper than the real thing and practically as effective. Another interesting fitting is the hanging Cupid pendant illustrated in fig. 7. The statuette is 9 in. long and is supplied in bronze, old silver, or gilt. The shade can be any one of a wide range of colours.

Several new lines are being put forward by the Wholesale Fittings Co., Ltd., in addition to the further improvement of existing designs. As a substitute for alabaster, the company's "Altolite" glassware is very effective and absorbs far less light. A large variety of bowls, globes, and lanterns in this material are supplied by the company with different coloured veining. A new design is the flaked-white bowl shown in fig. 6; this is decorated with black lines in a very artistic way. The company also has new lines of hand-painted bowls and many other types of fitting, as well as new examples of "Supastone" three-ply glassware.

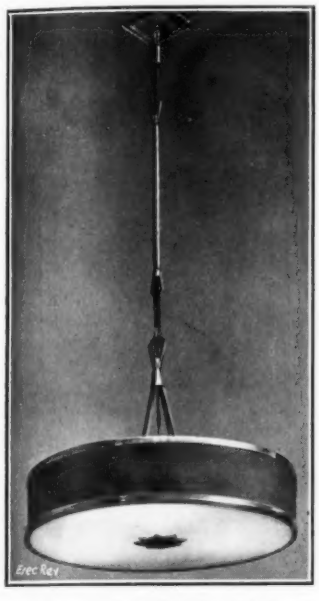


Fig. 8.—A Handsome Dining Room Fitting.

Fig. 9.—A Scenic Glass Shade.

Fig. 10.—A Best & Lloyd Wall Fitting.

Fig. 11.—A Floral Table Lamp.

Fig. 13.—A Harcourt Wall Bracket.

Fig. 12.—A "Moonstone" Shade.

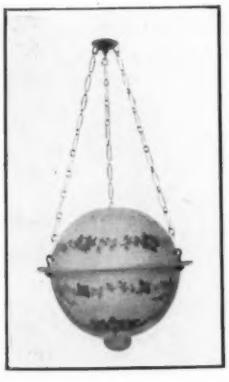


Fig. 14.—Decorated Glassware Ball.

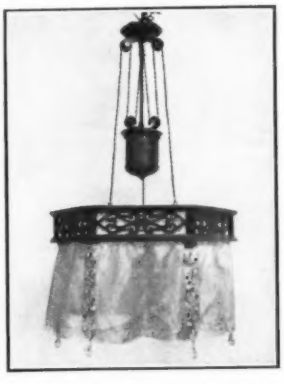


Fig. 15.—A Wood Shade Fitting.

Fig. 16.—A "B.A.G." Diffuser.

Fig. 17.—A Harcourt Pendant.

A comprehensive catalogue of lighting glassware has been issued by Siemens Electric Lamps & Supplies, Ltd. In this fittings in many kinds of glass are illustrated. One of the "Moonstone" range is shown in fig. 12, which is a view of a fluted shade with a diameter of 15¼ in. for use with a 300-W lamp. A smaller shade supplied by the company is that depicted in fig. 9. This is one of a number of "scenic" designs in fancy glass. It bears a lake view and has an amber top and a blue edge.

The chief merit of the wall bracket illustrated in fig. 10 is its extreme simplicity. It consists of three panels of obscured rimpled glass, which are held in the fluted metal bands by screws. The heads of the screws are flattened and faceted octagonally. The fluted bands are coloured cream, stippled red or blue, and the octagonal facets are treated in oxidised brass. This fitting is made by Messrs. Best and Lloyd, Ltd., as is the one depicted in fig. 8. The latter consists of a tinted parchment band between two glass plates. The top glass is of thick opal, making the fitting dust-proof, and it throws the light downward. The bottom glass is of rimpled texture, and is generally supplied in a firelight tint. The lamps are easily accessible and the fitting is one which will harmonise with almost any dining-room decorative scheme. The fitting has a diameter of 20 in. and is 3 ft. 6 in. long.

A novel table lamp is included in the new lighting fittings of Lighting Trades, Ltd. This is in the form of bunches of flowers delicately modelled in china. Tulips, daffodils, hyacinths, all lend themselves admirably to this form of decorative table lamp, which is supplied in these and other patterns. For restaurants, cafés, and similar places floral table standards suggest themselves as an ideal fitting, and they would also form acceptable presents. An example is illustrated in fig. 11.

Fig. 18.—A "Firelite" Bowl.

Fig. 19.—A "Firelite" Pendant.

Fig. 20.—A Simple Silk Shade Fitting.

Messrs. Falk, Stadelmann & Co., Ltd., have this year extended the range of wood fittings which are produced at their works. An example of this class of work is the shade fitting shown in fig. 15. This consists of a polygonal fretted frame supported by the wires. The counterpoise and ceiling plate are also of wood. Another of the company's fittings is the decorated glassware ball illustrated in fig. 14. This is an example of a large variety of glassware which is to be seen at the company's showrooms. Messrs. Falk, Stadelmann also have an extensive range of parchment shades and hand-painted parchment bowls.

A typical "diffuser" supplied by the British B.A.G., Ltd., is illustrated in fig. 16. This type of lighting fitting is produced in many styles for domestic and commercial use. The one shown is admirably fitted for the kitchen, being absolutely dustproof and giving a diffused light which softens shadows. It has been adopted by the Halifax Electricity Department in its "all-electric" kitchen.

The "Harcourt" lighting fittings made by Metro-Vick Supplies, Ltd., cover a multiplicity of handsome designs, some of which are illustrated herewith. The three-light pendant shown in fig. 17 is an example of artistic metalwork characterised by its lightness of execution. Fig. 13 illustrates a two-light wall bracket in which the same craftsmanship is evident, while fig. 20 depicts a simple pendant with a tasselled silk shade.

Figs. 18 and 19 show examples of "Firelite" fittings supplied by the Sun Electrical Co., Ltd. The first has a long panelled vertical portion to which is attached a bowl formed of "Firelite" glass panels. This kind of glass has a very delicate shaded orange colour from which its name is derived. Fig. 19 illustrates a double-tier pendant fitting, the straight lines of which are relieved by the gently curved edges.

A number of improvements have been made to its lighting fitings by the Excelsior Shade Manufacturing Co. In the "Betterway" pendant the oval links have been replaced by a new shield and long-link chain. Two new rise-and-fall models have been added to the "Betterway de Luxe" range, and another new season's feature is a "Lift-it-on" attachment which replaces the old type of bowl fitting with an improvement in appearance.

Other Domestic Appliances.

A Few Miscellaneous Examples.

In the preceding articles we have dealt with the principal classes of domestic electrical appliances, particularly those which offer a variety of methods and designs. The following notes deal with some of the many other electrical devices which add to the comfort and convenience of the home.

The electric toaster is a very useful table appliance which is available in many patterns. The toaster illustrated in fig. 1 is a product of the British B.A.G., Ltd. It has a loading of 400 W and clips for the bread on each side. The connections are well insulated and the body is heavily nickel plated; the weight is 1½ lb.

Another toaster is illustrated in fig. 3. This is the "Redot" model made by Lighting Trades, Ltd. (incorporating J. & W. B. Smith). It is fitted with a plug-in element guaranteed for two years and toasts both sides of the bread at once. The finish is nickel plate, as usual.

A new device which should prove of service in many homes is the "Magnet" gramophone motor illustrated in fig. 4. This, as the name will suggest, is made by the General Electric Co., Ltd., and is suitable for

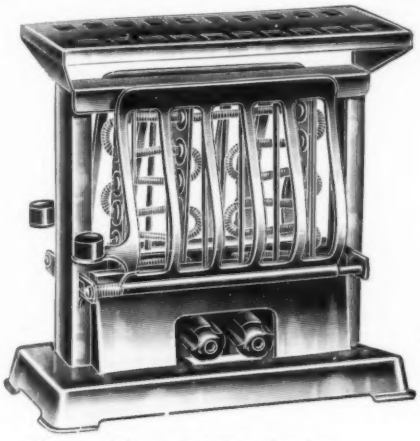


Fig. 1.—The 'B.A.G.' Toaster.

fitting to almost any existing gramophone cabinet. The motor is wound for low pressure, and excess voltage is taken up by a vacuum lamp which acts as a buffer and compensates for every rise and fall of pressure, with the result that constant speed is maintained. An automatic starting and stopping switch is provided. This

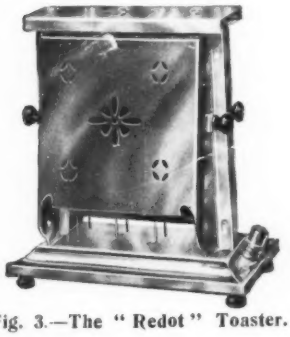


Fig. 3.—The "Redot" Toaster.

is designed so that immediately the tone arm is placed on the beginning of a record, the motor is switched on; when the arm reaches the centre, the current is automatically switched off. Another "Magnet" appliance is the hair dryer (fig. 5). An addition to this is an

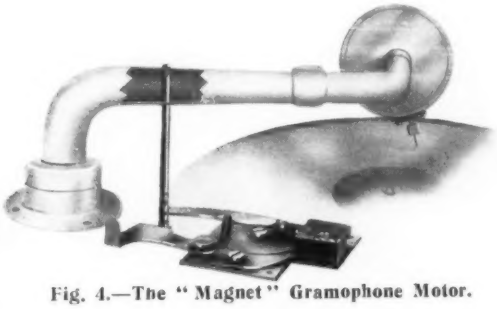


Fig. 4.—The "Magnet" Gramophone Motor.

attractive nickel-plated stand. The dryer is controlled by a three-way switch having "hot," "cold," and "off" positions. The motor is of the "universal"

type, being suitable for operation on either d.c. or a.c. (25-60 cycles). The consumption of the motor is 25 W, and that of the heater 600 W.

An acceptable addition to the "Premier Duplex"

Fig. 2.—Polishing Attachment for a Cleaner.

vacuum cleaner has been made by the Hotpoint Electric Appliance Co., Ltd. This is a polishing device which takes the place of the vacuum cleaner brush. In fitting this, the dust bag is first removed and the exhaust orifice is closed with the little fitting seen at the left of the accompanying illustration (fig. 2). The straps

Fig. 5.—The "Magnet" Hair Dryer.

on the attachment are swung over the front castors of the cleaner and screwed up tight, and the driving belt is then fitted.

Many uses can be found for the handy little "Pic-Up" cleaner, which is also supplied by the Hotpoint

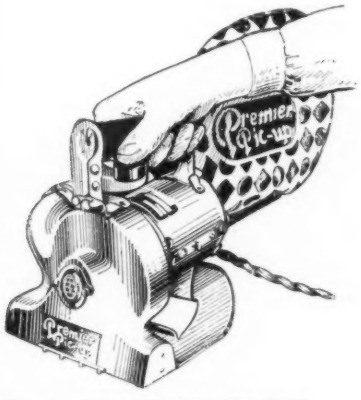


Fig. 6.—The "Premier Pic-Up."

Fig. 7.—The "A.B.C. Spinner" Washer.

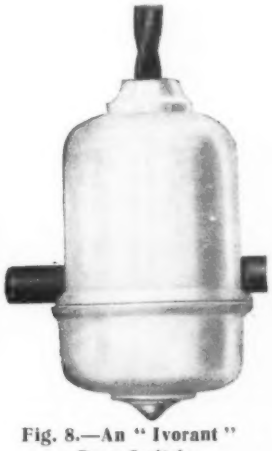


Fig. 8.—An "Ivorant" Pear Switch.

Co. As will be observed from fig. 6, the appliance is used in a similar manner to an electric iron—and it weighs only 4 lb. The cleaner has a motor-driven

bristle brush in the nozzle. It glides along on a metal shoe, which can be easily removed when necessary. If required, a long handle can be fitted, which makes it suitable for work in which the normal type of cleaner is employed.

Fig. 7 illustrates the "A.B.C. Spinner" washing machine supplied by the Sun Electrical Co., Ltd. This machine possesses a number of outstanding features which make it a desirable addition to the home. In the first place, the control is very simple, and all moving parts are enclosed. The body consists of a square porcelain-enamelled tub and a centrifugal spinner or dryer. In the tub is a cast-aluminium gyrator operating at 104 impulses a minute. The spinner is a one-piece vitreous-enamelled metal container, and above it is a revolving drainboard which can be locked in any position. The whole is mounted on three legs, which can be easily adjusted to a convenient height.

Fig. 9.—The "Goltone" Battery Charger.

Fig. 10.—The Cooper-Stewart Bowl Fire.

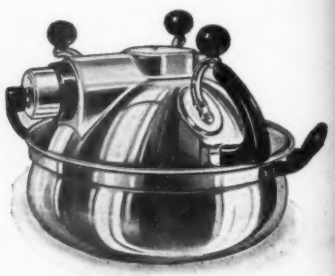


Fig. 11.—The Fire in Use for Grilling.

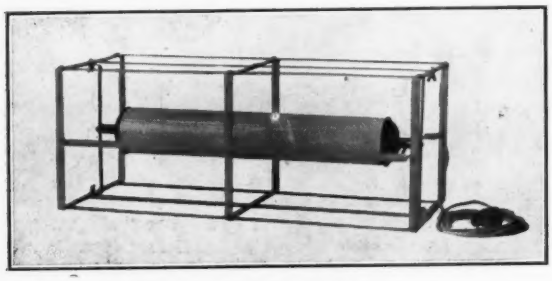


Fig. 12.—A Novel Bed-warmer.

Messrs. Ward & Goldstone, Ltd., are the makers of the "Ivorant" pear switch depicted in fig. 8. This has a very robust action, and is fitted with three terminals, permitting its use as a one-way or two-way switch. The casing is of high-grade insulating material, which can be produced in any one of a number of colours. Another Ward & Goldstone product which should prove useful in many homes is the "Goltone" battery charger (fig. 9). This device, which can be employed for high- or low-tension batteries, comprises an ammeter and polarity indicator. The charging current is governed by the size of the lamp which is inserted in the holder.

Figs. 13 and 14.—The "New Junior" Adaptable Fire.

Among the domestic appliances produced by the Cooper-Stewart Engineering Co., Ltd., is the multi-purpose heater-cooker depicted in figs. 10 and 11. The first illustration shows it as a bowl fire with a 650-W plug-in element and a three-heat rotary switch. A large variety of cooking utensils are available, and fig. 11 shows one of them in use with the bowl fire for grilling purposes. The other utensils include a kettle, stewing pan, casserole, baking set, &c.

The novel bed-warmer illustrated in fig. 12 is produced by Messrs. Sturge & Baker, Ltd. It consists of a heating element (100 W) enclosed in a metal cylinder, which, in turn, has a covering of asbestos cloth. The whole is mounted in a square or circular frame which keeps the bedclothes well away from the heater. Although at first sight the size would appear to be an objection to the device, it is really not a handicap, as it ensures that the warmer is not overlooked. The company makes a collapsible frame, which can be supplied if desired.

The "New Junior" adaptable fire is another dual-purpose appliance, although perhaps not so versatile. Fig. 13 shows it in use as a radiator—it has a loading of 500 W. In fig. 14 it is shown boiling a kettle. It can, of course, be used for a number of minor cooking operations. This appliance is made by Messrs. John Shaw & Sons, Wolverhampton, Ltd.

The "Selco" domestic refrigerator illustrated in fig. 15 is supplied by Messrs. S. G. Leach & Co., Ltd.

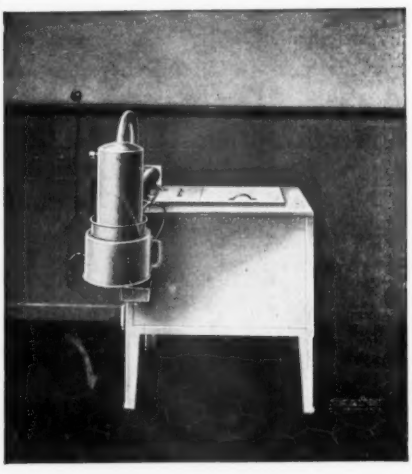


Fig. 15.—The "Selco" Refrigerator.

This appliance, which can be operated by electricity, gas, or oil, has no moving parts, and it is claimed that it requires only a few minutes to set the freezing process in operation. It has a cooling space 22 in. long, 13 in. wide, and 15 in high. It takes 1,300 W, for about one hour daily.

1928.

by the
multi-
1. The
650-W
tch. A
ble, and
fire for
kettle,

se

is pro-
consists
metal
asbestos
circular
rom the
appear
y not a
ot over-
, which

r dual-
rsatile.
has a
iling a
mber of
nade by
LTD.
ated in
., LTD.

tricity,
laimed
reezing
. long,
W, for

Electricity in Canadian Homes.

Progress due to the Supply Authorities' Activities.

By A. S. L. BARNES, A.M.I.E.E.

THERE has been very general electrical progress throughout Canada, but the relative position of one part as compared with another seems to be about the same. In dealing with Canada in matters relating to the entire Dominion, it is usually convenient to start at one side of the country and work across to the other. This method will be followed in the present article.

British Columbia.

On the Pacific coast in and around Vancouver, the British Columbia Electric Railway Company supplies electrical energy over a very large area from a number of large hydro-electric stations. The use of domestic electrical appliances is becoming quite extensive, particularly in Greater Vancouver.

This Company is already supplying about 4,100 electric ranges and some 2,700 water heaters and, even in rural districts where attractive rates have recently been put into force, appreciable increases in the numbers of these two appliances are confidently anticipated.

No fewer than seven sales rooms and a large merchandising staff are maintained by the Company and they have special selling campaigns in operation continuously (presumably, first for one kind of appliance, then for another), as this has been found to be an excellent method of popularising appliances. Practically every block of apartment houses built during the past year has installed electric refrigerating plant, and the older apartments are being compelled to follow suit.

According to the vice-president of the B.C. Electric Railway Company, reduced rates are responsible for accelerating the rate of installation of ranges. Rates in Vancouver have been steadily lowered from 20 cents per kWh in 1900, to a step rate of 4 cents and 2 cents.

Alberta and Saskatchewan.

These two provinces have relatively small and scattered populations, so that there is little to record about them, and with the exception of the city of Winnipeg, the same is true of Manitoba.

Manitoba.

Winnipeg, on account of the great activity displayed by both the municipal Winnipeg Hydro-Electric System and the privately-owned Winnipeg Electric Co., claims wonderful results achieved during the last decade. The City's plant was put into operation in 1911, when the domestic rates for electricity were fixed at 3 cents per kWh for lighting, and 1 cent, less 10 per cent. discount for heating and cooking. The war was responsible for so curtailing the building-up of industries in the City that something had to be done, and attention was turned to the domestic field.

In 1917, the Winnipeg "Hydro" started selling electric ranges and has done so well that the proud boast is made that Winnipeg has more electric ranges in use than any other city in the world, irrespective of size.

From 1917 onwards, the sale of electricity for the use of large appliances, such as electric ranges and water-heaters, has increased from about zero to $600,000 per annum, and is still increasing at the rate of about 12 per cent. per annum. In addition to this increase, the earnings from energy sold for electric lighting have increased appreciably, due, no doubt, to the extensive use of smaller appliances in the lighting circuits. Over 20,000 electric ranges and 7,500 water heaters are in use in Greater Winnipeg and it is said to be almost impossible to sell a gas range. The Winnipeg Hydro spends from $15,000 to $20,000 per annum in advertising domestic electrical appliances. At the present time practically every new house that is built is wired for an electric range and an electric water-heater, as well as at least one "outlet" in every room. It is said to be very difficult to let an apartment that is without an electric range.

As indicating the aggressive manner in which the sale of appliances is handled, it may be stated that last year the turnover in the Appliance Department of the Winnipeg Hydro was more than $300,000, which included the sale of nearly 1,200 ranges; the total turnover during the past 11 years has been about $3,000,000. In addition, various private firms supply appliances as well as the Hydro.

The Winnipeg Electric Company and its associates are also active in and around Winnipeg, and have been selling appliances for several years to extend the use of electrical energy for domestic purposes, and the results have been such that the Company claims that the energy consumption per annum per residence, is approximately 3,000 kWh; this is claimed to be eight times that of the average figure prevailing in the United States and more than twice that of Toronto in Ontario.

The use of electric refrigerators is becoming very general in Winnipeg, and for the last three years in practically every apartment house that has been built, electric refrigeration has been installed. The *Electrical Retailer* (Canada) states, in relation to the work of the Winnipeg Hydro-Electric System that, due to the fact that all wiring contracts for ranges sold by the "Hydro" are let to local electricians by tender, over $500,000 worth of work has been created for local men within the last eight years. The following details also come from this source:—

Range and Water Heater Sales by the Winnipeg Hydro-Electric System.

Year.	Ranges.	Water Heaters.
1916 ...	8 ...	2
1918 ...	460 ...	45
1920 ...	1,073 ...	318
1922 ...	832 ...	392
1924 ...	1,652 ...	1,479
1926 ...	1,620 ...	629
1928 Jan. to Apr.	430 ...	353

It is remarkable that in 1924 in which the highest figures in the above table appear, the sales of other appliances all showed very substantial increases varying from 12 per cent. to 80 per cent. over the previous year, the records of which were by no means insignificant as the following figures show:—

Washing Machines	320	Lamps	32,120
Electric Grates ...	59	Table Lamps ...	330
Hotplates	237	Air Heaters ...	369
Toasters	315	Smoothing Irons ...	460

For a city having a population of only about 300,000 the record of Winnipeg is a remarkable one, and for that reason has been given in detail.

Ontario.

In this province there is relatively very little current used for domestic purposes that is not supplied by the Hydro-Electric Power Commission of Ontario, so that a record of progress in the territory served by the Commission will represent the province as a whole.

The Annual Report of the Commission for 1927 shows that more than 80 per cent. of the electrical energy utilised for domestic service is sold in municipal areas, where the average charge to consumers of this class is less than 2 cents per kilowatt hour.

Some very interesting statistics regarding the use of electrical appliances on the Commission's systems have recently been given out, and the progress made in the

period 1924 to 1927 is well illustrated by the following figures which, although estimated, are believed to be reasonably accurate.

Appliance.	Dec. 31st, 1924. No. in use.	Installed capacity kW.	Saturation per cent.	Dec. 31st, 1927. No. in use.	Installed capacity kW.	Saturation per cent.
Ranges	47,505	285,030	13·8	83,298	499,788	21·3
Hotplates	18,883	37,766	5·5	34,178	68,356	8·9
Washing Machines	55,342	11,068	15·8	92 219	18,443	23·5
Vacuum Cleaners	64,205	12 841	18·6	88,539	17,707	22·5
Water Heaters ...	16,665	25,000	4·8	32,211	48,316	8·2
Grates	15,075	30,150	4·4	13,309	26,618	3·4
Air Heaters	103,000	82,400	30·0	131,531	105,225	33·4
Ironers	1,590	4,770	0·4	2,403	7,209	0·6
Smoothing Irons...	307,800	203,148	89·2	363 476	239,894	92·8
Refrigerators ...	657	130	0·2	11,176	2,235	2·9
Toasters...	152,200	83,710	44·1	171,317	94,224	44·2
Grills	46,800	30,888	13·8	44,254	29,207	11·3
Total	—	806,901	—	—	1,157,222	—

The total number of domestic consumers supplied with current from the Commission's systems at the end of 1927, was 372,166, so that the connected load in appliances only, exclusive of lamps, was about 3.1 kW per consumer. This appears to be a high figure, but there is plenty of scope still in the percentage saturation in everything except electric smoothing irons.

Quebec.

Amongst the more important companies supplying electricity in the province of Quebec, are the Montreal Light, Heat and Power Consolidated, which supplies only in the city of Montreal; the Electric Service Corporation which distributes power generated by the Showinigan Water & Power Company; the Gatineau Electric Light Company and the Southern Canada Power Company. The first-named supplies both gas and electricity, and operates nine stores where both electrical and gas appliances are exhibited and sold, while in addition much advertising is done in the local Press. In Montreal, all the ordinary electrical appliances except electric ranges and water heaters, are used extensively, and it is owing to the relatively low cost of gas that these two are not more common. The Company reports that both electric and gas refrigerators have become popular within the last two years.

The Electric Service Corporation, which operates in and around Shawinigan Falls and Three Rivers, where there are no really large centres of population, reports that the use of appliances is not very extensive yet, but that it is increasing at a fair rate. Special efforts are being made to add to the number of appliances used, by means of cookery schools, demonstrations, moving picture films and special talks.

The Southern Canada Power Company also operates in the province of Quebec—amongst the smaller towns This Company is gradually building up a good demand for electric refrigerators, and is confident that a very satisfactory volume of sales can be developed. The appliance business is increasing each year, and the revenue received from domestic consumers is also showing an appreciable increase this year. The following list of appliances sold during 1927 is very creditable, considering the nature of the territory served:—

Smoothing Irons	385	Water Heaters ...	172
Toasters ...	221	Air Heaters ...	60
Hotplates—2 burner	58	Vacuum Cleaners ...	187
,, 3 burner	26	Curling Irons ...	300
Ranges	220	Percolators	52
Grills	90	Washing Machines ...	215

The Gatineau Electric Light Company, although its head office is in Ottawa, Ontario, carries on its operations on the other side of the river, in the province of Quebec, and again no large towns or cities are supplied.

This Company states that appliances are being very generally used in its territory, but not nearly so extensively as in Ontario. The Company operates nine retail stores and is very aggressive in its propaganda.

Merchandising campaigns are held throughout the year in which sales contests are run, premiums given, and long-term payments arranged for. About 1,000 ranges are installed and 100 water heaters, while electric refrigeration is becoming more popular every year, although the high initial cost of domestic electric refrigerators is considered to hinder growth in their use.

Nova Scotia.

As elsewhere, in the larger places the use of electrical appliances is fairly extensive and is growing steadily. Up-to-date sales rooms are yielding results and in several towns where rates have been lowered the effect has been beneficial.

The domestic kilowatt-hour demand per consumer per annum is increasing and, taking Halifax as an an example, the figures for the last three years are:—

Year.	1925	1926	1927
Demand in kWh	345	382	395

New Brunswick.

In the last two years in St. John, which has a population of about 60,000, some 1,500 ranges have been installed each year. The cost of current is 2½ cents per kWh. The rural districts and smaller towns are said to respond just as readily to the efforts made to popularise the use of appliances, as the more thickly populated districts. During the past four years the number of domestic consumers in St. John, has increased at the rate of 15 per cent. per annum, and the domestic load in somewhat greater proportion. A deferred payment system for the wiring of houses has met with considerable success, and has helped greatly in building up the domestic load.

Considering conditions generally in this country it is clear from the foregoing that the figure at which domestic rates are set has a great influence on the sale of domestic electrical appliances, and that the actual cost of the appliances themselves is not a very serious bar to their extended use. It is, however, true that nothing much can be done unless active steps are taken to induce the public to purchase appliances by giving full information about them and establishing them.

The appliances in most common use are, of course, those already mentioned, but electrically-operated sewing machines, floor-polishers, forced draft fans for oil or coal heated domestic furnaces (open fireplaces are not common in Canada), are also used, as well as batteryless radio sets.

The Canadian Electrical Association, as was explained in the article of a year ago, arranges, annually, a competition amongst its member firms to stimulate the sale of appliances, and prizes are given to those whose takings per customer are the highest.

During the eight months period over which the competition extended last year, the Southern Canada Power Company took the first prize at one of its stores (shops) and the second at another, while the third prize was won by the British Columbia Electric Railway Co.

The values of the sales, per customer, for the three prize winners were as follows:—

1st $17.88; 2nd $10.25; 3rd $10.22.

According to figures appearing in a recent number of *Commerce Reports* (issued by the Bureau of Commerce of the United States Government), Canada (in addition to having a fairly large home production of electric washing machines) imported during May only of this year (1928) $144,885 worth of such machines.

The so-called "Red Seal" movement has become well-established in several parts of Canada, notably in Toronto. This is a scheme whereby the Electric Service League, which is composed of electrical contractors, is endeavouring to establish minimum standards for the wiring of houses and apartments. Architects and builders are beginning to recognise the fact that if the electrical installation in a house be up to the Red Seal standard, the house is likely to sell more readily. In Toronto 80 per cent. of the 818 houses built during the first half of 1927 were "Red Seal" houses.

The acknowledgments of the writer are due to the various undertakings which have kindly furnished much of the information given herein.

Electrical Progress in New Zealand.

The Government's Hydro-Electric Schemes and the Work of the Electric Power Boards.

By F. T. M. KISSEL, B.Sc., A.M.Inst.C.E., M.I.E.E.,
Chief Electrical Engineer, Public Works Department, Wellington.

ALTHOUGH the first electrical installation of which there is any record dates back to 1887, it is only in recent years that marked progress has been made in the electrification of New Zealand.

Two measures which have had the greatest influence on this progress are the Water Power Act of 1903 (since embodied in the Public Works Act of 1908) and the Electric Power Boards Act of 1918. The great increase in the use of electricity which has taken place since the passing of these two Acts has necessitated the passing of the Wireman's Registration Act, which seeks to ensure that none but fully-qualified men shall be employed on the wiring of buildings. This increase in electrical development has also necessitated a revision of the regulations governing the erection of lines and the wiring of houses. These are termed respectively the Electrical Supply Regulations, 1927, and the Electrical Wiring Regulations, 1927. In framing these, assistance was sought from the Supply Authority Engineers' Association, the Electrical Traders' Federation, and the Fire Underwriters' Association. Engineers from these associations in co-operation with Government engineers representing the Public Works, Post and Telegraph, and Railway Departments, devoted much of their spare time and expert knowledge to the by no means easy task of attempting to frame rules which would provide adequate safety to life and property, without at the same time unduly restricting the service which electrical energy is capable of rendering in the various occupations of urban and rural life. The Water Power Act vested in the Crown all rights to use waters in rivers and streams for power purposes, with the provision that such rights might be delegated where circumstances warranted. The Government now owns and operates the chief hydro-electric power stations and main transmission lines and sub-stations, and sells 3-phase 50-cycle power at 11,000 V in bulk at suitable points to the various supply authorities throughout the Dominion.

Mr. F. T. M. Kissel, B.Sc.

The pressure adopted for the main transmission lines was 110,000 V, and 50,000 V in the North Island, and 66,000 V and 110,000 V in the South Island. These pressures will, of course, be increased should this course prove economical.

The Electric Power Boards Act provides for the setting up of a local electrical body whose sole purpose is to provide for the supply of electricity to the inhabitants in its particular district. In general it buys power at 11,000 V and distributes at this pressure, and also at 400/230 V. The size of the areas controlled by the Boards varies, but each comprises both town and country as far as possible. Where supply is taken from one of the main Government schemes, the area is such that it can be reticulated economically from one main sub-station or point of supply, and may include areas up to 700 or 800 square miles in extent. The Boards have wide powers, either to generate or purchase power, and to distribute and sell this power within their districts. Rating powers over the districts are given, and the rates are pledged as security for the loans which, of course, are necessary to carry out construction works. The reticulation systems cost considerable sums of money. They must be designed to provide, not only for present needs, but also for future requirements. The Boards cannot, in all cases, be expected to earn sufficient revenue in earlier years to meet all capital charges and operating expenses, and provision has been made to allow them to capitalise interest charges during construction and to carry forward initial losses over a period of years. These losses must, however, be paid out of future profits. This arrangement has allowed the reticulation to be pushed out into the country districts to a greater extent than would have been possible under any scheme of private enterprise, which would have been tempted to develop the more prosperous portions of the country first, and to leave the more sparsely settled portions without supply. Although in the earlier country reticulations there may have been instances where unprofitable areas were reticulated, in the past three or four years greater caution has been observed, and in practically no case are lines being extended out into areas unless sufficient guaranteed revenue is in sight to provide a reasonable return on the investment. The returns published in this article are those for the period ended March 31st, 1927. The returns for the next year are not yet complete, but from those already to hand it is clear that the rate of progress is being maintained.

Since the Power Boards Act came into operation, 54 Boards have been formed. The total population included in the various areas of electric power supply is 1,239,535, or 90 per cent. of the total population of the Dominion, so that the ideal of a supply available to every home in the Dominion is well on the way to realisation. The maximum demand per head of population in the areas supplied is 0.085 kW. The energy sold per head of population supplied amounts to 310 kWh. The total length of distributing line is 14,975 route miles, an increase of 20.3 per cent. upon the previous year's figures. The number of consumers per route mile is 15.2. The maximum power demand per route mile of line is now 7.1 kW, the sales 25,700 kWh, and the revenue £193. The sales and revenue are substantially better than the corresponding figures for the

previous year, while there is no increase in the corresponding maximum power demand.

The needs of the community are supplied by 35 water-power stations, 8 steam, 5 gas, and 3 oil-power stations. The two largest steam stations are those at King's Wharf, Auckland, owned and operated by the Auckland Electric Power Board, and at Evans Bay, Wellington, owned and operated by the Wellington City Council. The former has an installed capacity of 29,800 kW, and the latter 10,000 kW. The oil and gas stations are all of small capacity. The largest of the water-power stations are those installed by the Government after the passing of the Water Power Act.

In 1915 the first of the water-power stations, that at Lake Coleridge, in the South Island, went into operation with an installed capacity of 5,300 kVA. The capacity of this station at the present time is 31,800 kVA, and an additional unit now on order will bring this up to 40,600 kVA. In 1919 the Government purchased from the Waihi Gold Mining Company the power station at Horahora, in the North Island. Its capacity at that time was 7,450 kVA, but the plant has since been increased to 13,000 kVA. The station is considerably overloaded at the present time. Towards the end of 1924 the Government station at Mangahao, in the North Island, commenced operation. This has an installed capacity of 24,000 kVA, and at the present time is overloaded. Three more stations are in course of construction. The first to be completed will be that at Lake Waikaremoana, in the North Island, with an installed capacity of 40,000 kVA. This station is capable of extension, the ultimate capacity being 150,000 kVA.

The second station, that at Arapuni, in the North Island, will be completed in 1929. Its initial capacity will be 54,000 kVA. At a later date this station will be increased until a capacity of 144,000 kVA is reached. The third station under construction is situated on the Waitaki River, in the South Island, and will have an initial installed capacity of 33,332 kVA. The ultimate capacity is 83,330 kVA.

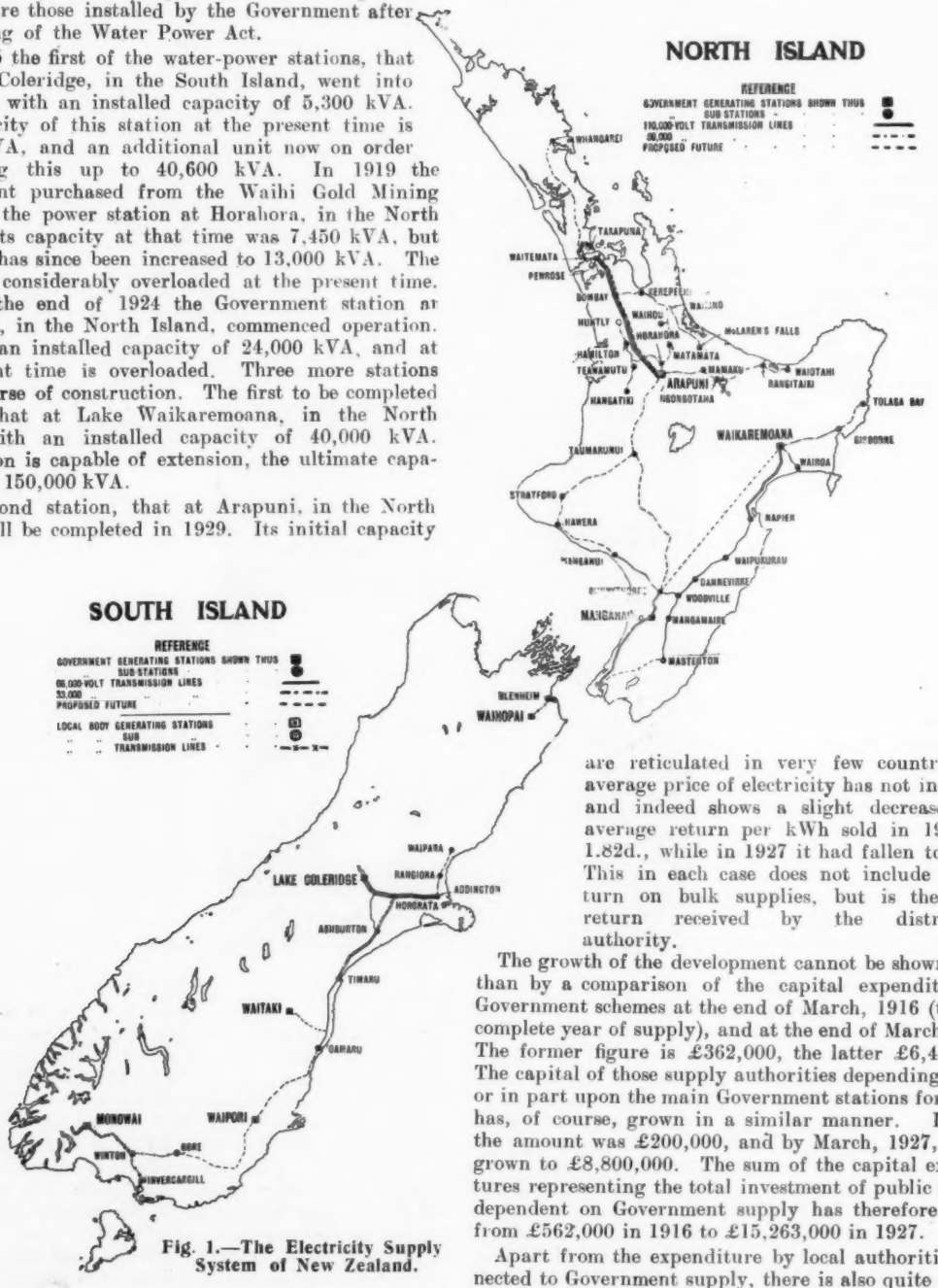


Fig. 1.—The Electricity Supply System of New Zealand.

required can be generated and distributed at comparatively small increases in cost. The magnitude of the scheme has undoubtedly led to heavy capital charges during the past few years, and an analysis of the average cost per unit of electricity over the years since the Lake Coleridge scheme first went into operation may not disclose any great reduction in cost. Still, despite the fact that since that date nearly every other commodity has increased at some time or other to prices far above 1916 costs, and though supply has been taken into areas undreamed of a few years back, and into areas such as are reticulated in very few countries, the average price of electricity has not increased, and indeed shows a slight decrease. The average return per kWh sold in 1920 was 1.82d., while in 1927 it had fallen to 1.58d. This in each case does not include the return on bulk supplies, but is the actual return received by the distributing authority.

The growth of the development cannot be shown better than by a comparison of the capital expenditure on Government schemes at the end of March, 1916 (the first complete year of supply), and at the end of March, 1927. The former figure is £362,000, the latter £6,427,923. The capital of those supply authorities depending wholly or in part upon the main Government stations for power has, of course, grown in a similar manner. In 1916 the amount was £200,000, and by March, 1927, it had grown to £8,800,000. The sum of the capital expenditures representing the total investment of public moneys dependent on Government supply has therefore grown from £562,000 in 1916 to £15,263,000 in 1927.

Apart from the expenditure by local authorities connected to Government supply, there is also quite a large amount invested by local authorities who have their own generating plants, and for the present at any rate run quite independently of assistance from the Government. Possibly the most important of these developments are those in Otago and Southland, run by the Dunedin City Corporation, and by the Southland Electric Power Board respectively. The expenditure of these bodies had reached the figure of £1,250,000 in 1916, and £4,493,000 in 1927. This does not show the same proportionate increase as do the previous figures owing to the great extent to which local authorities are buy-

ing their power in bulk from Government supply. The sum of the peak loads on Government stations since 1916 shows an average yearly increase of 42 per cent.

In the early days, electricity was used almost exclusively for lighting purposes. This was followed shortly afterwards by motor loads, and at a still later date by the domestic load. The change is shown in the following table giving the connected loads in kW on the Lake Coleridge System for the years 1921 and 1927 respectively:—

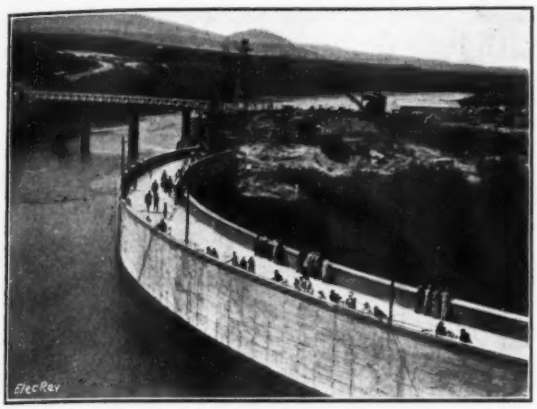


Fig. 2.—The Diversion of the Waikato River at Arapuni.

Year.	Lighting.	Per cent.	Heating.	Per cent.	Power.	Per cent.	Total.
1921	7,856	23	4,104	12	22,317	65	34,277
1927	21,702	19	54,263	48	36 459	33	112,424

An analysis of the connected loads of the other Government stations shows a similar tendency.

Returns to hand up to March 31st, 1927, show that the supply authorities had 9,511 electric ranges connected to their systems, representing an increase of 103 per cent. for the year. The number of consumers using electric water heaters rose from 6,654 to 14,160 during the year, an increase of 113 per cent., while in the dairying districts a total of 6,738 milking machines were connected to the system.

The majority of the ranges are of Canadian or American origin. Ranges of comparable price manufactured in Great Britain, although generally of more rugged construction, have not, up till recently, had the finish of the Canadian or the American article, and this has militated against their sale. Judging from recent samples in the showrooms, this fact is now appreciated by some at least of the British manufacturers.

The Government standard charges throughout New Zealand are at present as follows:—

For the first 200 kVA of maximum demand measured on the 11-kV side of the step-down transformers, £2 10s. per kVA per quarter.

Between 200 and 5,000 kVA of maximum demand, £2 per kVA per quarter.

Between 5,000 and 20,000 kVA of maximum demand, £1 15s. per kVA per quarter.

For all in excess of 20,000 kVA, £1 6s. 3d. per kVA per quarter.

The term "maximum demand" means twice the number of kVA-hours supplied in the half hour during which the number of kVA-hours is the maximum for the quarter.

As the highest rate, *i.e.*, £2 10s. per kVA of maximum demand, works out at 0.274d. per kWh for 24-hour loads of unity p.f., institutions buying power on the maximum demand basis and requiring large quantities of hot water, are finding it economical to obtain this electrically during off peak hours.

Railway electrification will no doubt progress at an increasing rate when supply from several sources becomes available in both islands. At the present time a section of the Midland line connecting the city of Christchurch with the west coast of the South Island is worked electrically. This section passes through the Southern Alps near Arthur's Pass by means of a tunnel over five miles in length in a gradient of 1 in 33. The electrification of a section approximately seven miles in length connecting Christchurch with the port of Lyttelton will be completed this year. On this section also there is a tunnel approximately 1¾ miles in length through the Port Hills. At the present time the electrification of the suburban lines in two directions out of the city of Wellington in the North Island is under consideration. The system of electrification adopted is d.c. supply at 1,500 V on overhead lines.

With the increasing loads that are everywhere manifest, the operation, management, and overhead costs per kWh should be reduced gradually, and as the costs are reduced so will other types of load become possible. In the next few years it is probable that the greatest increase in load will be for various domestic uses—for electric cooking and water heating. It is improbable for some time yet that we shall develop a very extensive load for manufacturing, such as has developed in Great Britain, the United States, and Canada. The wood pulp industry which has meant so much to hydro-electric power in Canada appears to offer possibilities of a considerable load in a few years' time, not, as in Canada, on the natural forest, but rather in connection with the various afforestation schemes which are now coming into prominence.

The large potential sources of power awaiting development on the Waikato River, on several of the rivers and lakes in the South Island, and in particular in the West Coast Sounds area, offer great possibilities in the way of providing large blocks of cheap power for any special manufacturing purpose where power is the chief consideration. A concession has been let to a private company in connection with one of these sources of power, and the Government is itself surveying, and will record the details of, other possibilities. Though it is not possible to prophesy at the present moment for what purpose this power will be used, it is certain that such great natural assets will within a few years be brought into use.

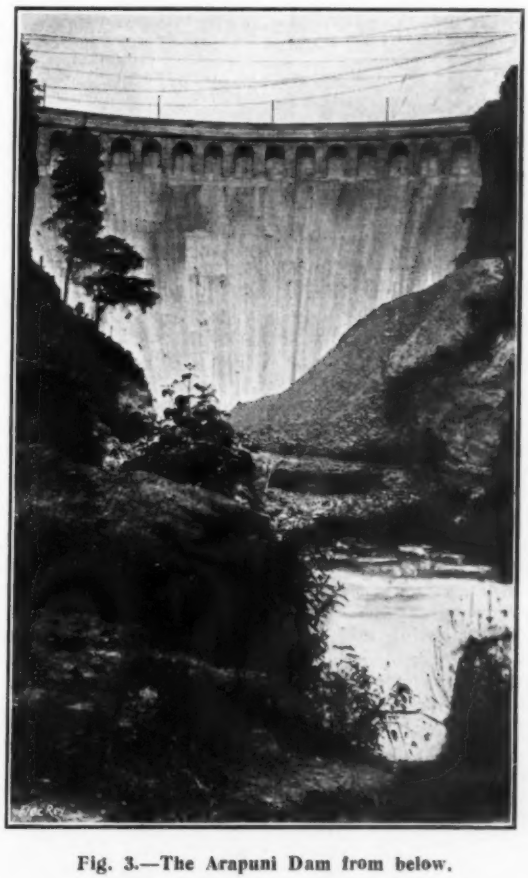


Fig. 3.—The Arapuni Dam from below.

Domestic Electric Developments in Durban, S.A.

The Rapid Advance of Cooking and Heating.

By E. POOLE, A.M.I.E.E.,
Assistant Borough Electrical Engineer, Durban.

SOME twelve months ago a review of the developments of domestic electricity in the principal South African towns was given in this Review, and while in such a short interval of time there has been no very marked progress generally, it is interesting to record the steady growth at Durban, the pioneer South African town in this direction.

A steady advertising campaign in the shape of a weekly electrical page in each of the daily newspapers, illuminated signs and posters about the town, advertising on tram tickets, also demonstrations, exhibitions, and competitions, as well as schemes of assisted wiring and purchase of appliances, all assist in keeping well before the public the uses of electricity, particularly as Durban very wisely offers current at the following attractive rates:—

In the Borough.	Out of the Borough.
Private Houses.	
5d. per unit on valuation as minimum. ½d. per unit thereafter.	6½d. per unit for 24 units as minimum. ½d. per unit thereafter. Also 7½d. per unit for 24 units as minimum. 1d. (net) per unit thereafter.
Hotels, Boarding Houses, &c.	
5d. per unit (night), minimum 7s. 6d. month. 2d. per unit (day), minimum 7s. 6d. month. ½d. (net) per unit (cooking and heating only), minimum 12s. 6d. month.	6½d. per unit (night), minimum 12s. 6d. month. 3d. (net) per unit (day), minimum 12s. 6d. month. 1d. (net) per unit (cooking and heating only), minimum 20s. month.
Flats.	
5d. per unit (night), minimum 7s. 6d. month. 2d. per unit (day), minimum 7s. 6d. month. ½d. per unit (cooking and heating only), minimum 7s. 6d. month.	

The above charges, except where otherwise mentioned, are subject to a discount of 10 per cent. if paid within seven days.

Electric Cooking.

An electric cookery competition held in Durban in June last clearly demonstrated the popularity of the electric stove, for there were 1,300 entries from competitors, as against 473 entries in a similar competition held two years ago.

The following table will be of interest as showing in detail the rapid development since 1922, when electric cooking was more seriously tackled, the past year constituting a record in the number of stoves and heaters connected by an addition of 1,404 stoves and 791 heaters, making a grand total connected of 4,365 stoves and 3,191 heaters.

Year ended July.	Stoves added.	Stoves Total.	Heaters added.	Heaters Total.
1923	110	476	292	472
1924	228	704	324	796
1925	307	1,011	372	1,168
1926	646	1,657	521	1,689
1927	1,304	2,961	711	2,400
1928	1,404	4,365	791	3,191

These figures are shown more clearly in the accompanying curve (fig. 1). The growth in units sold is equally interesting and dates back to 1914, when the cooking and heating energy used only represented 3½ per cent. of the total units sold, whereas to-day it has increased to close on 30 per cent. While it is somewhat difficult accurately to separate units used as between lighting and cooking, it can be fairly well taken that those units sold at from 1d. to ½d. are used for cooking

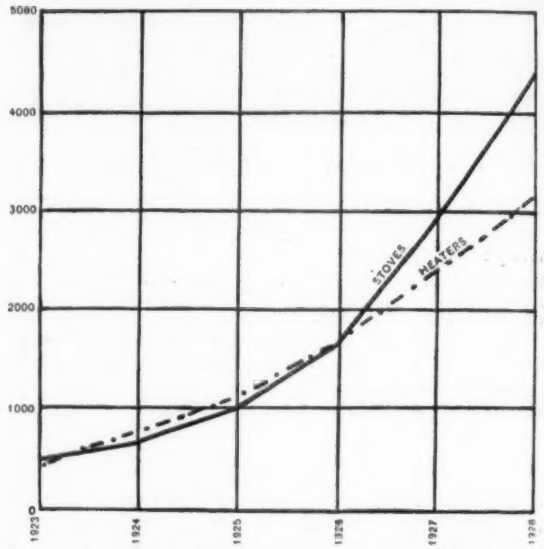


Fig. 1.—Growth of the Durban Heating and Cooking Sales.

and heating and are listed under column A, while column B shows the units used for lighting also, and column C shows the grand total units sold for all purposes, private and industrial, and it has to be borne in mind that Durban has a large industrial load.

Units Sold—1914-1928.

Year ending July	A. Units. Cooking & Heating.	B. Units. Light, Cooking & Heating.	C. Units. Grand Total.	Percentage. A to B.	Percentage. A to C.
1914	548,214	2,570,941	15,426,678	21.3	3.5
1915	862,025	2,971,184	17,639,922	29.0	4.8
1916	1,135,636	3,495,841	20,025,906	32.5	5.7
1917	1,497,840	4,[illegible]7,186	21,997,881	35.6	6.8
1918	1,893,355	5,042,634	23,886,670	37.5	7.9
1919	2,328,315	5,700,761	25,897,208	40.8	8.9
1920	2,892,598	6,661,162	28,593,769	43.4	10.1
1921	3,362,746	7,815,068	30,101,109	43.0	11.2
1922	4,059,798	8,9[illegible]6,201	33,370,151	45.5	12.2
1923	5,001,384	10,3[illegible]8,115	36,488,846	48.1	13.7
1924	6,[illegible]54,340	12,799,174	41,871,922	52.8	16.1
1925	8,636,982	15,602,988	48,153,245	55.4	17.9
1926	11,170,163	19,082,888	55,8[illegible]4,166	58.5	20.0
1927	15,736,553	24,[illegible]55,344	62,697,951	64.4	25.1
1928	20,830,819	30,177,558	69,868,629	69.0	29.8

The other curve, B, sets outs clearly the growth as given in this table. Large extensions are now in hand on the distribution side, especially in the recently added 16 square miles of suburban area, where it is as yet not possible to meet all demands for cooking. Tenders have lately been invited for transformers and overhead equipment approximating £4,000 so as to reinforce the distribution system in these suburbs forthwith, while further extensions have lately been authorised as follows:—Pinetown, £5,750; Sarnia, £1,050; Hill Crest, £5,345; Gillitts, £565; Shortlands, £2,300; Oil sites, £1,400; Point, £3,850.

Other Progress.

While an assisted wiring scheme is available, not a great deal of use is now made of it, but the assisted purchase of stoves scheme is proving itself very popular, there having been advanced approximately £70,500 since April, 1925, covering 2,185 consumers, and of this amount approximately £40,000 has been paid back. Another novelty is now being advanced in Durban in the shape of synchronous clocks in the home controlled from the power station. Refrigerators of

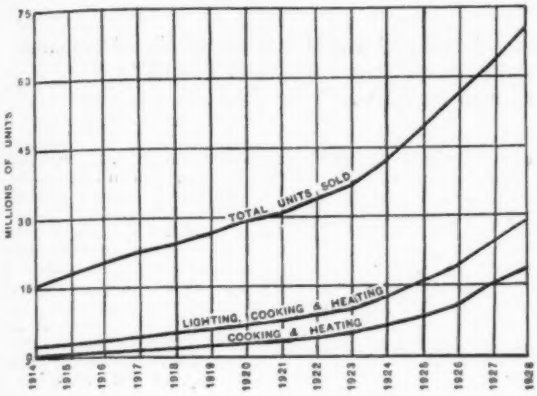


Fig. 2.—Analysis of the Durban Expansion.

various types are also becoming popular, while vacuum cleaners and other accessories make the "all-electric" home complete in all detail.

Apart from the domestic side, efforts are now being made to introduce heating for industrial purposes, and within the past three months an electric bakery has been established, its equipment consisting of a 50-kW oven of the M.-V. conveyor type, with automatic temperature control and capable of baking 7,000 2-lb. loaves daily.

Correspondence.

Correspondents should forward their communications as early as possible. *No letter can be published unless we have the writer's name and address in our possession.*

Replacement of Apparatus on Changing-over.

With great respect I venture to suggest to Mr. W. Eric Jackson that Ss. 17 and 18 of the 1882 Act, and Section 28 of the (Clauses) Act, 1899, are not relevant to the question of liability of authorised undertakers to replace consumers' apparatus on a change of pressure, system or frequency.

Section 28 of the Clauses Act does not mention the pressure of supply. The consumer cannot require the undertakers to give him any other than the "declared" pressure. The apparent effect of that Section in non-technical language is that if the consumer requires an increased supply (*i.e.*, a larger current) the undertakers may claim the reasonable cost of providing a larger service cable, meter, possibly a larger main, &c. It also provides for the case where a consumer's requirements may seem unreasonably large to the undertakers, equally irrelevant to the subject.

As regards the application of S.17 of the 1882 Act, is not the kind of damage limited by the words: "the powers . . . given to them under this Act"? Strictly, the powers given under the Act are only the powers to break up streets, &c. At the date of the Act no statutory authority was needed to erect a generating station and to supply electricity, but no one could legally break up the King's Highway to lay electric mains. The Act legalised such "works."

Section 77 of the Clauses Act is rather more definite about responsibility for damages, but, again, they are "by reason of or in consequence of any of the undertakers' works," seeming to refer to damage to third parties, not to consumers.

If undertakers put an excess voltage on the consumers' service, breaking lamps or doing other damage, presumably they come under a common-law liability for the damages; such things have happened, and the undertakers have made good the damages as a matter of course. But could a legally authorised change of pressure, frequency or system give a claim for damages beyond claims specified in the conditions or regulations of the sanction?

Nor does Section 18 of the 1882 Act, with which may be read S.27, sub-sections (4), (5) and (6) of the Clauses Act, seem more relevant to the subject. They empower the undertakers to prevent the consumer from using apparatus, or playing pranks, which jump the voltage on the mains, by cutting off the supply or refusing to connect. Undertakers have made use of these provisions by limiting the use of induction motors taking excessive starting currents; and cutting off or refusing to connect faulty installations; but they cannot prevent any use of the supply which does not interfere with or jeopardise the regularity of supply to other consumers.

As regards the regulations affecting the replacement of consumers' apparatus on a change of pressure, frequency or system, they seem to be at the discretion of the Commissioners, but presumably this discretion is liable to correction by the Courts. There are, it may be noted, three different proceedings by which changes of pressure, frequency or system may be authorised. First, on the initiative of the undertakers, by their asking for an alteration of the approved system and declared pressure, which may involve a public inquiry at which any objections will be heard; secondly, by an Order of the Commissioners on the undertakers, under S.24 of the 1919 Act; third—only as to frequency of the system—under S.9 of the 1926 Act. Only in the last case is there a statutory direction as to the costs of alteration or replacement of consumer's apparatus.

Speaking generally, undertakers are entitled to be kept informed of the apparatus installed by consumers, and it seems likely that substantial difficulties will only arise where battery chargers and eliminators have been installed without notification to the undertakers; or where there is disagreement between the parties as to what constitutes an efficient substitute for the apparatus rendered useless by any legalised change.

H. M. Sayers.

London, *October 14th*, 1928.

Insulating Oils.

Considering the infrequent appearance of articles on insulating material in British technical journals, it was with pleasurable anticipation that I noticed an article on insulating oil in your issue of the 5th instant, only to find on perusal that the article in question contained many inaccurate statements. A few instances will suffice.

The author refers to the B.E.S.A. Specification 148-1927, and then in contradiction bases his article on figures culled from the old and now obsolete specification 148-1923.

Such a statement as "*good* oil would require a minimum of 22 kV (r.m.s.) for complete breakdown" (see old specs.) is hardly acceptable, as the new British Specification states that oil must withstand 30 kV (r.m.s.) for *one minute* and oil need not be particularly good to pass this test.

Again, under the heading of "Sludging" the author gives the figure 100 c.c., as being the quantity of oil to be used in the sludge test. I suggest that the B.E.S.A. Specification should be more carefully read, as he will find the figure stated as 100 grammes. On the whole the paragraph on "Sludging" seems to be a series of inconclusive statements, giving an erroneous impression.

The section of the article devoted to "Filtering" is very disappointing, stating as it does that "Dust and other suspended foreign matter may *usually* be removed by filtering through some finely woven linen."

My own impression is that the *usual* practice is to use a blotter press, or even such a modern appliance as the centrifugal separator. I rather think that these appliances would also remove the "finely woven linen" fibres introduced into the oil by Mr. Giles's method, besides dehydrating it.

J. E. T. Cogle.

Manchester, *October 10th*, 1928.

In reply to your correspondents, Mr. E. B. Wedmore and Mr. J. E. T. Cogle, I would point out to Mr. Wedmore that I have a great respect for the work of the B.E.S.A., but the suggestion that the B.E.S.A. specification is necessarily the last word on the subject I consider to be the height of bigotry.

To Mr. Cogle I would state that my article does not pretend to enlighten those who have facilities to make elaborate tests. I have endeavoured to help those who have a minimum of apparatus at their disposal. On the points of the minimum breakdown strength of oil and the very brief outline I gave of the B.E.S.A. sludging test, I agree with Mr. Cogle that 30 kV and 100 gm. would be the correct figures. I do not, however, agree with him that my purposely brief paragraph on sludge testing was misleading. It is fairly obvious that the B.E.S.A. test is impossible outside a well equipped laboratory, and to further enlarge would be useless to the average engineer. With regard to filtering, I am quite aware that the *usual* practice would be to use a filter press or a separator *where these are available*. The amount of loose fibre on finely woven linen is negligible.

I make no apology for the article in general, and consider that if it is of use to only a few of those for whom it was intended it will have fulfilled my purpose in writing.

Arthur Giles.

Smethwick, *October 13th*, 1928.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Factory Lighting Campaign.

We have received from the Lighting Service Bureau copies of three booklets which have been produced in connection with the Factory and Workshop Lighting Campaign. These are very attractively got up and deal respectively with the electric lighting of offices, printing works, and textile factories. In each of them appropriate lamps and fittings are illustrated and examples are given of good and bad installations. The value of good lighting is stressed by diagrams showing the increase of production engendered by properly designed installations.

Our Foreign Electrical Trade.

The following were the values of imports and exports of electrical goods and machinery during September, 1928 :—

	Sept., 1928.	Inc. or dec. as compared with Sept., 1927.	9 months, 1928. Inc. or dec.
Imports.	£	£	£
Electrical goods and apparatus	381,669	− 14,759	+ 351,565
Machinery	1,231,109	− 77,903	+ 648,387
(Including electrical machinery)	97,649	− 30,925	+ 104,084
Exports.			
Electrical goods and apparatus	1,079,554	+ 75,171	− 81,156
Machinery	3,688,209	−602,747	+4,381,537
(Including electrical machinery)	399,024	−181,216	− 86,295
Re-exports.			
Electrical goods and apparatus	14,817	+ 2,981	+ 18,792
Machinery	118,217	− 19,128	+ 127,499
(Including electrical machinery)	11,078	− 1,893	+ 30,866

The Position of the Electrical Industry.

In our issue of June 8th (p. 1015) we reviewed a survey of tendencies in the electrical trade by the British Electrical and Allied Manufacturers' Association. This took a hopeful view of the future, and even pointed to a coming glut of orders for electrical manufacturers. Last week, however, another survey by the Association's Economical and Statistical Department was issued in which very contrary views were expressed. After pointing out that the electrical supply industry provides an indication of the industrial and general economic position, it states that, whereas the normal annual rate of expansion of electricity production is between 10 and 11 per cent., so far this year it has been less than 7 per cent. This movement can only be attributed to intensified trade depression; it has discounted for some time the possibility of rapid expansion in power production, and has allowed the provision of new generating plant to catch up with the demand for power. The general trade depression has been accompanied by depression in the power industries, and there are few indications of recovery. In the first three months of this year the most active industrial areas were the South-West Midlands and the Mersey and West Lancashire districts, but there has since been a steady decline in both areas. In Lancashire and Yorkshire the same tendency has been manifest. The only districts which have shown a tendency to improve have been the North-East Coast and Sheffield, and the West of Scotland areas. The picture presented is one of a gradually intensifying state of depression in all the basic industries, with the exception of shipbuilding and certain branches of steel production, and signs of recovery are not at present visible. Since March of this year the position has become rapidly worse, and has neutralised all the optimistic prophecies which were made at the beginning of the year, especially with reference to a boom in power production.

The survey goes on to state that the lack of improvement in the industrial situation has adversely affected the electrical manufacturing prospects. The demand for industrial electrical equipment generally constitutes about 40 per cent. of the entire output of heavy electrical plant, and any fall that takes place in this demand is felt at once. The result has been that during this year electrical manufacture has shown no increase. Its shipments, both on industrial and public supply account, have barely kept level with the totals reached in 1927, which were only slightly superior to those of the preceding year. The orders placed by the Central Electricity Board brought relief to the cable manufacturing and transformer branches of the industry, and allowed them to maintain a high level of production. For almost a year the curve of export orders has declined steadily, but this movement has now come to an end, and there are definite indications of improvement. Important overseas contracts have been secured recently, and, on export account the outlook is still hopeful, but competition, especially from Germany and Switzerland, is increasing, with the result that profit margins have practically disappeared. There may be sufficient turnover to keep the factories sufficiently employed, without, however, yielding any real surplus for the financing of important contracts in the future. Public supply undertakings in this country, which showed a tendency at the beginning of the year to budget for very considerable extensions, have cut down their requirements to the minimum, with the result that, in the event of any real trade improvement, they may find themselves unable to cope with the load which will be developed.

An "Exide" Luncheon.

The Chloride Electrical Storage Co., Ltd., entertained a large company of representatives of the Press and motor-car industry to luncheon at the Clarendon Restaurant, Hammersmith Broadway, on October 11th. Mr. D. P. Dunne, secretary and director, who was in the chair, outlined the company's activities. He said the past year was the best in the history of the company, and the continued expansion all over the world was due in no small measure to the after-sales service. The price of "Exide" starting and wireless batteries had been reduced, and the company now catered for all makes of cars and wireless sets. It listed no fewer than 124 types of car-starting batteries. On the wireless side a specially large h.t. battery, having a capacity of 10,000 milliampere-hours, had been placed on the market, and unspillable cells were provided for portable wireless sets which functioned fully when the sets were in either of two positions. To facilitate the charging of batteries, the company had put upon the market the "Exide" trickle charger in three designs, *viz.*, one for h.t. batteries, one for l.t., and one which would charge both h.t. and l.t. batteries at the same time. Mr. Dunne also referred to the excellent welfare organisation at the company's works at Clifton Junction.

An Illumination Design Course.

The first lecture of the eighteenth Illumination Design Course was given on October 10th, at the Lighting Service Bureau, Savoy Street, W.C.2. An audience of some 170 representatives of all branches of the electrical industry assembled and the proceedings were opened by a brief address by Mr. C. A. Hughes, vice-chairman of the E.L.M.A. Sales Committee, who presided. After extending a welcome to the visitors, Mr. Hughes pointed out how past experience had proved the value of those courses in assisting the industry to keep pace with the rapid advancement of modern electric lighting and in bringing its service before the public. Mr. W. J. Jones then delivered a lecture entitled "Light and Visibility." By means of demonstrations and lantern slides he showed that "eye efficiency" was directly affected by lighting conditions and that, provided glare was avoided, the possibility of employing high intensities in illumination were almost boundless.

Railway Electricians' Wages.

On October 11th the Industrial Court heard the application of the railway companies for a reduction of 6s. per week in the wages of men employed in their generating stations and sub-stations. A suggestion by the companies that the men concerned should agree to a reduction of 2½ per cent. in common with other railway employés was not agreed to by the unions opposing the application—the Electrical Trades Union and the National Union of Railwaymen. The Court reserved its decision.

J. H. Holmes & Co., Ltd.

We recorded in our last issue the formation of J. H. Holmes and Co., Ltd., on October 3rd, to take over the Newcastle partnership business of that name. We are now informed that the following are directors of the new company: Mr. Wilfred Hall, A.M.Inst.C.E., J.P. (chairman), who was formerly with the Newcastle-upon-Tyne Electric Supply Co., Ltd., and later chairman and managing director of the Hexham and District Electric Supply Co., Ltd., and is a director of the Bede Metal Co., Ltd.; Mr. Norman D. Newall, who was formerly director of Turner & Newall, Ltd., and Newall's Insulation Co., Ltd., and is a director of the Tyneside Electrical Development Co., Ltd.; and Sir A. N. Lindsay Wood, Bt., who is a director of the Harton Coal Co., Ltd., A. Reyrolle & Co., Ltd., and the Newcastle & District Electric Lighting Co., Ltd. It is the object of the new company to continue and improve upon the work of the original firm. The following will be some of its principal products: Motor-generators for electroplating; Holmes-Clatworthy duplex motor equipments for driving large newspaper printing presses; sine-wave testing sets; searchlights of all types and sizes; transformers, particularly those of special construction for pressure and current testing, and similar purposes; and motor-generators up to 500 kW and rotary convertors up to 125 kW, in addition to products of equal importance, though of a more usual type, such as a.c. and d.c. generating sets, and motors, &c. The new company will have increased facilities for research and development, a large staff and a very complete laboratory equipment being now at its disposal.

A Presentation by Callender's.

On October 6th a very interesting ceremony formed part of the proceedings at the festival service at Newchurch Kenyon Parish Church, which has recently been wired for electric lighting, when Mr. John Bowyer, the manager of the works of Callender's Cable & Construction Co., Ltd., Leigh, Lancashire, on behalf of that company, presented a silver gilt replica of a mediæval chalice to Lord Derby as a memento of the occasion. Lord Derby, thanking the donors for the beautiful gift, handed it over to the Rector to be kept for ever as a memorial. The cup is a copy of one in the possession of the Dean and Chapter of Rochester Cathedral.

Glasgow to Buy Continental Wire.

At a meeting of a sub-committee of the Glasgow Corporation Tramways Committee on October 10th offers for a quantity of wire were submitted, and it was found that several British firms quoted the same price—£1,262. These firms, the tramway manager said, were part of a "combine." A Continental offer, which was £156 less than that of the British firms, was accepted, only three members voting for acceptance of the British offer. It is stated that the prices of the British non-combine firms were even higher than those of the combine.

Local Exhibition.

Newport (Mon.).—An Ideal Home Exhibition was opened last week. One of the attractions is an all-electric bungalow arranged by the Corporation Electricity Department. It consists of two bedrooms, dining room, bathroom, kitchen, scullery and entrance hall, each with its appropriate appliances. Electric cooking is demonstrated upon a stand which has also been arranged by the department.

The Guildford Electrical Exhibition.

Within a few months of the opening of its new power station the Guildford Corporation, in conjunction with

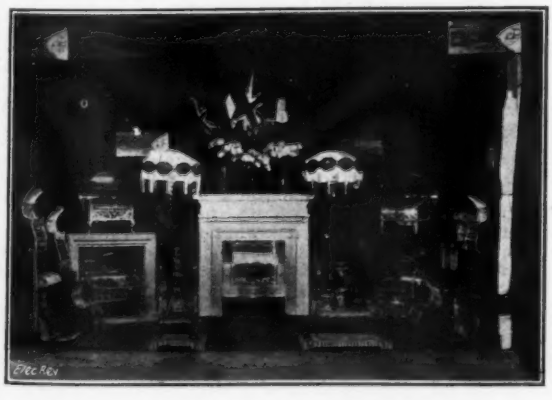


Fig. 1.—A "Magicoal" Display at Guildford.

local traders, arranged a ten-day electrical exhibition. All the local traders were represented and the outstanding feature was a full-sized model bungalow, staged by the Corporation Electricity Department (engineer, Mr. W. E. Affleck). On the first day of the exhibition the bungalow attracted considerable attention. All the rooms were lavishly furnished and contained every form of electrical household appliance. The exhibition was opened by the Mayor, who said that the inauguration of the new power station had been followed by a considerable reduction in the charges for electricity. He claimed that the exhibition contained almost all that was available in the way of electrical appliances. The Drill Hall was used for the purposes of the exhibition, and most of the stands were arranged

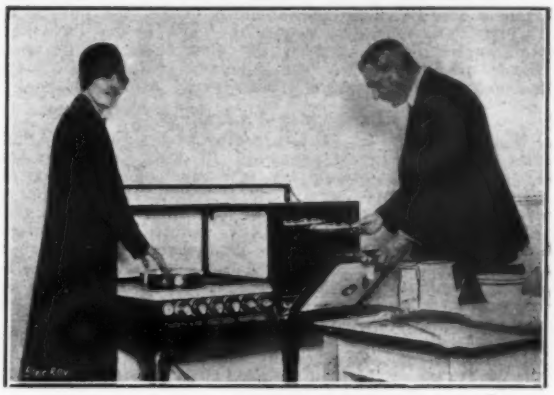


Fig. 2.—The Mayor Cooks Electrically.

in an original manner. The first picture illustrates a display of "Magicoal" fires, while the other shows the Mayor operating a "McClary" cooker.

The Post Office Foreign Contracts.

A reply to Mr. T. Bolton's letter regarding the contracts for bronze wire placed with French and German firms (Elec. Rev., October 12th, p. 627) has been issued by the Post Office. After stating that it is the Postmaster-General's duty to secure supplies on the most favourable terms, the reply points out that 99 per cent. of the goods purchased by the Post Office are of British manufacture. Identical prices for the wire in question were quoted by the British tenderers and a suggestion that the order should be given to one or two firms best equipped for the work to secure a reduction in price was rejected. It is stated that the position with regard to copper wire was similar until non-association tenders were accepted, when the associated firms reduced their prices year by year until they are now 20 per cent. below the pre-war level. On the other hand, the price of bronze wire is 65 per cent. above the pre-war price. Tenderers for bronze wire are invited to quote prices for bronze wire as "such and such a figure above the current price of copper wire bars."

"The Postmaster-General is averse on general grounds from disclosing tender prices, but he feels justified on this occasion in stating (1) that the lowest price 'over copper wire bars' which the associated firms in England would accept was between 35 per cent. and 40 per cent. above the prices quoted by the French and German firms with which the order was placed; and (2) that the British firms were definitely offered substantial orders at 20 per cent. above the foreign quotation, but this offer was rejected."

The G.E.C. in New Zealand.

The Wellington Branch of the British General Electric Co., Ltd., in New Zealand, has just been moved from Empire Buildings, Willeston Street, to the N.Z. Automobile Chambers, a comparatively new building in Taranaki Street. Half a century ago the land on which the premises stand was a tidal mud-flat occupied by New Zealand native Maoris.

Unemployment.

There was an increase of 41,170 in the number of registered unemployed during the week ended October 1st. The total at that date was 1,336,400, as compared with 1,295,230 on September 24th, and 1,075,880 on October 3rd, 1927.

Education for Salesmanship.

An advisory committee has been appointed by the President of the Board of Education to consider, and make recommendations upon, the problem of education for salesmanship. Mr. F. W. Goodenough is the chairman, and among the thirty members are Sir Edward Manville, Mr. P. J. Pybus, M.I.E.E., Sir Gilbert C. Vyle, and Col. the Hon. Vernon Willey. A teachers' panel has also been formed, including Major T. Worswick, O.B.E., principal of the Regent Street Polytechnic.

Long-Service Certificates.

An interesting presentation was made on Tuesday of this week by Sir George Sutton, Bt., the chairman of W. T. Henley's Telegraph Works Co., Ltd., at that company's works at North Woolwich, when about 250 employés received certificates in recognition of their having served the company for periods of from twenty to fifty years. Similar presentations are also to be made to employés at the Gravesend works of the company, and also at its head office and branches.

New Belgian Finance Company.

The *Financial Times* reports that a new finance company, called "Hydrofina," has been formed in Brussels, with 150,000,000 fr. capital, for the undertaking of electrical enterprises, mainly in Central Europe and Rumania. The company has the backing of the Société Générale de Belgique, the Banque de Bruxelles, the Banque d'Anvers, the Banque de l'Union Parisienne, the Banque de Paris et des Pays Bas, the Société Brown Boveri, the Compagnie d'Entreprises Electro-mécaniques, &c. The full name of the new concern is Compagnie Financière d'Exploitations Hydro-électriques.

Bankruptcy Proceedings.

W. Elliott and P. Eland, trading as the Burnley Armature Repairs, electrical engineers, 13, Cow Lane, Burnley, Lancs.—The public examination of these debtors was held recently at the County Court House, Burnley. The statement of affairs showed gross liabilities of £395, and a deficiency of £337. Debtors attributed their failure to bad trade and lack of capital and gradual depression in business since March, 1928. They commenced business in partnership as electrical engineers in May, 1928, Elliott having carried on business there on his own account since 1926. No partnership agreement was prepared, but debtor Eland deposited with the bank the title deeds of a house, to secure an overdraft. The business had not been successful, and since the commencement the weekly takings had not averaged more than £4 or £5. The hearing was adjourned to be closed.

B. E. M. Pook, 53a, Albert Road, Southsea, Portsmouth, wireless dealer.—The public examination of this debtor was held recently at Portsmouth, when the case was adjourned. The statement of affairs showed liabilities of £212, against assets of £31, leaving a deficiency of £181. Debtor stated that about two years ago he purchased a half share of a wireless dealers' business for £55, which he paid by instalments, and in September, 1927, he purchased the remaining share for £50. During the twelve months his turnover had decreased owing to severe competition, and he had been handicapped by an injury.

E. R. D. Lindsay, Victoria Road, Aldershot, wireless and cycle agent.—The receiving order herein was made on the debtor's own petition; the statement of affairs shows liabilities of £1,098 and assets of £384, leaving a deficiency of £714. Debtor attributes his failure to keen competition, heavy working expenses, and depreciation of stock.

E. W. Blair (Blair & Son), electrical engineer and contractor, late of 6, Queen's Parade, Brent Street, Hendon.—Receiving order made October 5th, on debtor's own petition. First meeting October 19th, at 29, Russell Square, W.C. Public examination November 15th, at the Court House, Barnet.

W. R. Grigsby (Wenham Lighting Corporation), electrical factor, 184, Gray's Inn Road, W.C.—Application for discharge to be heard November 9th, at Carey Street, W.C.

H. Wood, electrical and radio engineer, Market Place, Meltham, Huddersfield.—Receiving order made October 8th, on debtor's own petition.

P. F. Brittain, electrical engineer, 110, Cannon Street, E.C., &c.—Last day for proofs for dividend October 27th. Trustee, Mr. W. A. J. Osborne, Balfour House, 119, Finsbury Pavement, E.C.

Company Liquidations.

Great Eastern Rubber Co., Ltd., 31, Norton Folgate, E.1, wireless and cycle accessories factors.—A meeting of creditors was held on October 8th. As Mr. Bersey, the liquidator, was unable to be present, one of the partners presided. A statement of affairs was presented which disclosed liabilities of £3,832, and net assets of £1,681, leaving an estimated deficiency of £2,151. The creditors decided to appoint a committee of inspection consisting of three of the principal creditors. Mr. Bersey will continue to act as liquidator. The following are creditors:—

	£		£
Siemens Electric Lamps and Supplies, Ltd. ...	382	Chloride Electrical Storage Co., Ltd.	116
Ever-Ready Co. (Great Britain), Ltd.	307	British Thomson-Houston Co., Ltd.	96
Mullard Wireless Service Co., Ltd.	237	Cossor, A. C., & Co., Ltd.	78
Dunlop Rubber Co., Ltd.	230	Edison-Bell, Ltd.	56
Powell & Hanmer ...	50	Goodyear Tyre Co. ...	52

Cecil Hodges & Co., Ltd.—The accounts filed under this liquidation show total liabilities of £25,319, assets valued at £11,236, and a deficiency of £28,481 with regard to contributories. Mr. E. T. A. Phillips, Official Receiver, reports that the company was incorporated in 1910 to acquire and carry on a business which had been run for about 20 years previously by Mr. H. C. Hodges. The issued capital was £15,000; the purchase consideration for the business was fixed at £998, and satisfied by the allotment of 998 ordinary shares in the company. The trading accounts from 1920 showed that the business had been carried on at a loss. On January 25th last, in consequence of judgment for £1,500 being obtained under a contract for building new works at Horley, the company's bankers demanded repayment of £7,403 secured by debentures, and on the same day appointed Mr. R. F. Frazer, Bank House, Stratford, as receiver and manager. The latter had carried on the business with a view to completing orders in hand and disposing of the business as a going concern, and had recently sold the remaining assets for £10,500. The failure of the company is attributed to the building of a new factory with insufficient capital at its disposal, and the large falling off of orders in 1927 in the electrical trade generally, which was probably caused by the uncertainty as to the effect of the Government's electricity schemes, and by the labour disputes in 1926; also to the increase in the company's salary bill in anticipation of increased business at the new works. Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., has been appointed liquidator, with a committee of inspection.

Short Wave Communications Development Co., Ltd.—A meeting is called for October 22nd, at Stilemans Works, Wickford.—Particulars of claims to the liquidator, Mr. C. L. D. Duff, Norwich Union Chambers, Chelmsford, by November 15th.

Electrical Units, Ltd.—Winding up voluntarily. Liquidator, Mr. C. S. Denham, 4 & 5, Warwick Court, Holborn, W.C., appointed September 29th. A meeting of creditors was held at the liquidator's offices on October 15th.

Accumulators of Woking, Ltd.—A meeting of creditors is called for October 19th at the offices of the liquidator, Mr. H. Tansley Witt, 5, Chancery Lane, W.C.

Hungerford and District Electricity Supply Co., Ltd.—Particulars of claims by November 9th to the liquidator, Mr. A. G. Cox, 7, Duke Street, Adelphi, W.C.

Rose Bros. Electrical Co., Ltd.—A meeting of members is called for November 9th at the offices of Messrs. Corfield and Cripwell, 119, Finsbury Pavement, E.C., to hear an account of the winding up from the liquidator, Mr. W. A. J. Osborne.

Private Arrangements.

F. W. Fifield, electrical and wireless dealer, 2, Small Street, Bristol.—The creditors in this matter met recently, when a statement of affairs was submitted which showed ranking liabilities of £1,298, and assets estimated to realise about £500. The deficiency was attributed to cash advanced to travellers on account of commission which was not earned, and also to the fact that the debtor had lent substantial sums of money to friends, which he had been unable to recover. A bankruptcy petition had been presented by a creditor, whose representative, however, stated that the proceedings might be withdrawn. The creditors decided that the matter should be dealt with under a deed of assignment, with Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., and Mr. H. A. Snell, Bristol, as joint trustees. The principal creditors are:—

	£		£
Leach, S. G., & Co., Ltd.	182	Burns & Co.	40
Halcyon Wireless Co. ...	35	Grothe & Son	41
Bankers	44	Magna Wire & Cable Co.	21
Hecht, L., & Co.	57	Maggs & Son	29

Dissolutions of Partnership.

A. J. Tarrant & Co., electrical engineers, William Street, Burton Latimer.—Mr. A. J. Tarrant and Mr. A. E. Streather have dissolved partnership. Mr. Tarrant will attend to debts.

Perseverance Electrical Co., electrical engineers, Vecqueray Street, Coventry.—Messrs. A. and R. D. and A. Runciman have dissolved partnership. Messrs. A. and R. D. Runciman will continue the business.

Trade Announcements.

On October 9th the new showrooms of the Abingdon Electric Supply Co., Ltd., were opened by the Mayor of Abingdon.

The registered office of the Sevenoaks & District Electricity Co., Ltd., has been changed from Salisbury House, E.C.2, to County House, 46-47, New Broad Street, London, E.C.2.

Messrs. Haslam & Stretton, Ltd., Cardiff, have acquired larger premises at 53, 54 & 55, Tredegar Street. They are also opening a battery-service station under the charge of Mr. W. J. Jones. The company's telegraphic address and telephone number will remain the same.

The Lunar Electrical Co., Ltd., announces that on Monday next the management of its Glasgow branch will be taken over by Mr. J. H. Miller, who hitherto has represented the company on the South Coast and in the Channel Isles.

Messrs. H. S. Phillips & Co., electrical engineers, 30, The Boulevard, Weston-super-Mare, have taken over the business of Mr. G. Pore, of Prospect Place, Boulevard, Weston.

Mr. W. V. Fairhurst, electrician, has opened new electrical showrooms at 205, Duckworth Street, Darwen.

Recent Contracts.

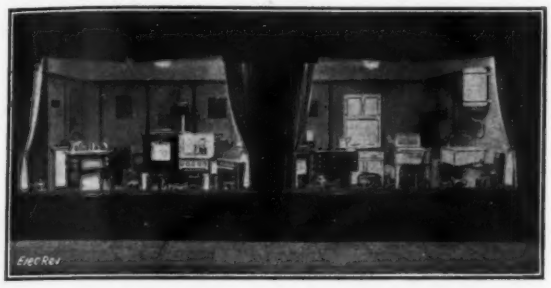
The Alton Battery Co., Ltd., has recently received orders for batteries ranging in capacity up to 6,450 Ah for the following telephone exchanges:—Avenue, Amherst, St. Albans, Malden, Paddington, Portsmouth, Aston, Leicester (repeater station), Primrose Hill, Aldershot, and Leith. Other batteries are being supplied to Foochow (China), Harbin (Manchuria), Changchow (China), Ceylon, India, and the Malay States.

Howden Ljungström Preheaters (1920), Ltd., has recently secured a third repeat order from the Shanghai Municipal

Council for air preheaters for the Riverside power station in that city. The contract is for four preheaters of the rotary regenerative type, each of which is to be installed on a 100,000-lb. boiler. The new plant will bring the total number of preheaters of this type in the station up to 11. The company is also supplying a high efficiency preheater, specially suitable for pulverised fuel boilers, to the Neasden station of the Metropolitan Railway Company.

Electrical Exhibition at Rugby.

A luncheon (electrically cooked) was held at the Rugby Urban Council's electricity showrooms on October 4th, to celebrate the electricity undertaking's 25th anniversary. The guests included representatives of neighbouring power companies and electrical manufacturers. On the same day an electrical exhibition was opened at the showrooms, to which the following companies contributed :—The British Thomson-



The Rugby Council's Electricity Showrooms.

Houston Co., Ltd. (lighting fittings, radio apparatus, &c.); the Hotpoint Electric Appliance Co., Ltd. (cookers, and domestic appliances); Metro-Vick Supplies, Ltd. (lighting fittings, cookers, &c.); Berry's Electric (1928), Ltd. ("Magicoal" fires and shaving mirrors); Electric Fires, Ltd. (water-heating apparatus); Santon, Ltd. (electric geysers); Premier Electric Heaters, Ltd. (fires, kettles, and irons); Inventum Electrical Appliances, Belling & Co., and Ferranti, Ltd. (fires). The accompanying illustration is a night view of the Council's showrooms.

New Catalogues and Lists.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—October stock list of dynamos and motors.

Messrs. Blackstone & Co., Ltd., Stamford.—Publication No. 442, illustrating and describing examples of the company's cold-starting oil engines, hopper cooled pattern with spring injection.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester.—The Met-Vick (Cosmos) wireless catalogue, containing very full particulars, with illustrations and prices, of the company's radio sets, components and accessories. The catalogue is conveniently arranged in sections, which are arranged for overprinting.

The Tungsram Electric Lamp Works (Great Britain), Ltd., 72, Oxford Street, W.1.—A coloured show card advertising "D"-type lamps. Also an illustrated folder, giving prices of the company's lamps.

The British Thomson-Houston Co., Ltd., Mazda House, Newman Street, Oxford Street, W.1.—Pamphlet L448, dealing with "Mazdalux" reflectors for the lighting of industrial premises. Illustrated and priced.

Messrs. D. H. Bonnella & Son, Ltd., 46 & 48, Osnaburgh Street, N.W.1.—Catalogue Section L, containing illustrations, details and prices of electric lighting accessories.

Messrs. Ferranti, Ltd., Hollinwood, Lancs.—Leaflets Hb450, illustrating and describing the company's electric fires; and Hb451, dealing with "Ferranti" domestic water-heating apparatus.

Messrs. Siemens Bros. & Co., Ltd., Woolwich, S.E.18.—Catalogue 820 (superseding Pamphlet 820A), containing very full details and illustrations of the company's thermo-electric pyrometers and their applications.

Drake & Gorham Wholesale, Ltd., 67, Long Acre, W.C.2.—An illustrated and priced catalogue of electric fires, irons, kettles and other domestic appliances of various makes.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—Leaflet No. 135R giving particulars of the company's large-capacity battery-charging rectifier; and Booklet No. 196, containing illustrations of installations of the company's neon tube signs.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester.—A very well produced catalogue of stationary storage batteries. A number of typical installations are illustrated, and a guide to the installing and working of these batteries is included. The cover design is very effective.

The Hoisting Appliance Co., 35-43, Hornsey Road, N.7.—An illustrated pamphlet dealing with the company's patent pit garages, with electric or hydraulic hoisting gear.

Messrs. Wheeler & Esser, 7, Upper Marylebone Street, Great Portland Street, W.1.—A price list of electric candle tubes of various patterns, sizes, and colours.

Marconiphone Co., Ltd., 210, Tottenham Court Road, London, W.1.—Useful cardboard radio valve chart.

Messrs. Falk, Stadelmann & Co., Ltd., Farringdon Road, E.C.1.—Publication No. P1269, containing illustrated details and prices of shop-window lighting equipment.

Messrs. Drake & Gorham, Ltd., Rockingham Works, Newington Causeway, S.E.1.—List No. 100, illustrating and describing the "Metesco" oil switch-fuse.

Messrs. A. H. Hunt, Ltd., Tunstall Road, Croydon.—Showcards strikingly illustrating their Hellesen 1½-volt "Tiger" dry cell, and the "Hetik" 45-volt h.t. battery; also a 16-page priced catalogue.

Guest's Brass Stamping Co., Cardigan Works, Belmont Row, Birmingham.—Illustrated list of hot die pressings in brass, copper and yellow metal for electrical parts.

The Unbreakable Pulley & Millgearing Co., Ltd., West Gorton, Manchester.—1928 pocket catalogue, 67 pp., giving illustrated descriptive and tabular particulars of shafting, bearings, &c., for mechanical power transmission, and containing various power transmission tables for engineers.

The Rothermel Corporation, Ltd., 24 & 26, Maddox Street, Regent Street, W.1.—A publication dealing with electric truck-haulage gear for use in railway sidings.

Rubber Industries, Ltd., Downham Mills, Tottenham, N.17.—A leaflet advertising the company's Chatterton compound.

X-Rays, Ltd., 47, Red Lion Street, High Holborn, W.C.1.—A booklet advertising the company's films for X-ray work.

Wild-Barfield Electric Furnaces, Ltd., North Road, Holloway, N.7.—Heat Treatment Bulletin No. 41.—"The Hardening and Tempering of High Speed Steel."

Messrs. Lacy-Hulbert & Co., Ltd., 91, Victoria Street, S.W.1.—List C2, illustrating and describing one of the company's automatic electrically-driven air compressors, suitable for large garages. Priced.

Mr. C. O. Clark, Mill Road, Deal.—A folder containing illustrations of installations carried out in the Deal district.

Messrs. C. W. Outram & Co., Woodville, near Burton-on-Trent.—A publication containing illustrations of various kinds of porcelain insulators—ceiling roses, fuse-boxes, resistance plates, line insulators, &c.

The Lovick Johnson Co., 125, Balham High Road, S.W.12.—A mailing card, advertising soot blowers, valves, &c.

The Benjamin Electric, Ltd., Tariff Road, Tottenham, N.17.—The "Benjamin Reflector" for October, containing illustrated notes on industrial lighting installations.

Messrs. Robert Hornby & Co., Ltd., 77, Dean Street, W.1.—Folder describing m.d. indicator for small consumers.

An "Xcel" Fire Display.

Among the features of the recent Liverpool Civic Week was a general shop-window display of the products of local industries, and one of the most attractive of these exhibits was that of a Tudor period "Xcel Cosyglo" imitation coal fire made by the Automatic Telephone Manufacturing

An "Xcel" Fire Display.

Co., Ltd. This fire gives a realistic imitation of the curling flames and occasional wisps of smoke. Set in appropriate surroundings with period furniture in a window of the Corporation Electricity Department showrooms, this fire attracted a great deal of attention, so much so in fact, that it has been decided to prolong the exhibit for a time. The accompanying illustration shows the fire in its setting.

New French Companies.

La Société des Transport et de Distribution d'Energie Electrique Lorraine-Hainaut has been formed in Paris (75, Boulevard Haussmann) with a capital of eight million francs.

A company has been formed in Paris (2, Rue de Londres) with a capital of 500,000 fr., and the title La Société Hydro-Electrique du Congo Française, to develop the water power resources of that colony.

For Sale.

Salford Corporation Electricity Department has for disposal a quantity of wrought steel piping, three steam receivers, and two d.c. balancers; Batley Borough Council Waterworks Department invites offers for two 220-b.h.p., 440-V, slip-ring induction motors, and one "Sirius" high lift centrifugal pump; Egham and Staines Electricity Co., Ltd., has for disposal one 500-b.h.p. English Electric Diesel engine, direct coupled to one 2,200-V, single-phase alternator. Liverpool Electric Supply Department invites offers for second-hand d.c. motors, slide rails, starting switches, motor generators, and wall fans. Mr. G. R. Lightfoot will sell by auction on November 1st, at 13, High Holborn, W.C., a large quantity of wireless sets and accessories, electrical and scientific instruments, &c. (See our advertisement pages to-day.)

South-East England Scheme Contract.

We are informed by the British Insulated Cables, Ltd., that it has received a contract for 1,300 miles of aluminium strand in connection with the South-East England Electricity Scheme.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Oct. 16th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£53	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£35	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£95 to £100	...
b	,, Wire ... ... per lb.	1/8 to 1/9	...
b	,, Sheet ... ... ,,	1/8 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—		
	Grade I ... ... per ton net.	£200	£5 dec.
	Grade II ... ... ,, ,,	£140	£1 dec.
	Grade III ... ... ,, ,,	£76	£1 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	9½d.	...
c	,, Tubes (solid drawn) ... ... ,,	1/- to 1/0½d.	...
c	,, Wire, basis ... ... ,,	10½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/1½	...
c	,, Bars (best selected) ... per ton.	£96	...
c	,, Sheet ... ... ,,	£98	...
c	,, Rod ... ... ,,	£96	...
d	,, (Electrolytic) Bars ... ,,	£71 15s.	£1 inc.
d	,, ,, Sheets ... ,,	£149 10s.	...
d	,, ,, Wire Rods ,,	£81 15s.	£1 inc.
d	,, ,, H.C. Wire per lb.	10-7/8d.	½d. inc.
f	Ebonite Rod ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India rubber, Para fine ... ... ,,	10½d.	½d. inc.
f	Iron Pig (Cleveland No. 3) ... per ton.	66/-	...
i	,, Wire, galv. No. 8, P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£23 10s.	5/- inc.
g	Mercury ... ... per bot.	£23 to £23 10s.	35/- to 40/- dec.
e	Mica (in original cases) small ... per lb.	3d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/3	...
p	,, ,, rolled strip & sheet ,,	1/3½	...
p	,, ,, wire... ... ... ,,	1/4	...
o	Platinum ... ... per oz.	£17 15s.	...
d	Silicium Bronze Wire ... ... per lb.	10½d.	½d. inc.
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton.	£219 10s. to £220	£3 10s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespears.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Reporting on the lead market on October 13th, Messrs. James Forster & Co. stated that indications pointed to a continued steady market with a firm undertone, while in the event of any increase in buying from Russia, before the closing of the navigation, prices would quickly respond and go higher. The Board of Trade returns for September, 1928, were: Imports, 16,161 tons; exports, 2,632 tons; left for home consumption, 13,529 tons.

Book Notices.

"The Electrical Contractors' Year Book, 1928-29." (463 pp.). London: The Electrical Contractors' Association. Price 5s.—In this new edition all the features of its immediate predecessor are retained. A report of the Allied Associations' third annual conference (Cheltenham) appears, together with Mr. W. A. Shaw's presidential address. A new section is "Wiring Specifications," which is a guide to architects and others calling for tenders for electrical installation work. This briefly covers materials; lay-out, including the positions of fittings; switch- and fuse-gear; earthing, &c. A model specification with suitable alternatives which is given should prove very useful both to the architect and the contractor.

Publications of the National Electric Light Association (America).—Serial reports of the Underground Systems Committee: "Conduit and Manhole Construction" (25 cents); "Inspection and Testing of Cable" (25 cents); "Cable Operation" (30 cents). Serial report of the Hydraulic Power Committee: "Hydro-Electric Bibliography and Manufacturers' Statements" (30 cents).

"Electric Circuits, Theory and Applications." Vol. I, "Short Circuit Calculations and Steady-state Theory," by O. G. C. Dahl. Pp. x+390; figs. 228. Price 25s. "Transformer Construction and Operation," by E. G. Reed. Pp. xii+226; figs. 129. Price 15s. London: McGraw-Hill Publishing Co., Ltd.

"Elements of Alternating Currents and A.C. Apparatus," by J. L. Beaver. Pp. xii+393; figs. 309. London: Longmans, Green & Co. Price 18s. net.

Lighting and Power Notes.

Aldershot.—Loan.—The Town Council has applied for sanction to a loan of £8,998 for extending the cables to the North Lane, Ash Road, and Brighton Road housing estates.

Barnoldswick.—Electricity Supply Deadlock.—The supply of electricity to the district is being held up through a deadlock on the question of bulk supply. The Yorkshire Electric Power Co. objects to the Council's proposal to take a supply from Nelson Corporation, and it is now left to the Electricity Commissioners to decide which body is to supply. The company was unsuccessful in its application against Barnoldswick Council for distribution powers. Its case is that unless it supplies Barnoldswick in bulk, it cannot economically supply the rural areas in accordance with its Order. The Council replies that it asked the company to quote for a bulk supply, but the company stated that it could distribute electricity more cheaply than the Council.

Batley.—Loans.—The Town Council has received sanction to a loan of £3,000 for mains and services, and has applied for sanction to a loan of £850 for cables and fittings.

Change-Over.—Application has also been made for permission to change the system of electricity supply from d.c. to a.c. in the Mount Pleasant and Taylor Street districts.

Bradford.—Year's Working.—We have received from Mr. T. Roles, city electrical engineer, a copy of the Electricity Committee's report, together with the abstract of accounts of the working of the electricity undertaking for the year ended March 31st last. The total revenue amounted to £556,338, and working expenses were £317,184, leaving a gross profit of £239,154. The previous year's figures were: Income, £576,161; working expenses, £350,755; gross profit, £225,406. To the gross profit was added an unemployment grant of £769, making a total of £239,923, and after payment of capital charges there was a net surplus of £31,229, as compared with £20,751 in the preceding year. A contribution of £20,000 was made to the borough fund. The capital expenditure during the year amounted to £150,053, and included £129,158 for mains and services. The sales of electrical energy increased from 77,461,658 to 86,758,306 kWh. The maximum supply demanded increased from 37,700 to 41,700 kW, and the average price obtained per kWh fell from 1.703d. to 1.447d. Work was commenced during the year on the excavations for the foundation work of the extra-high-pressure boiler plant and 30,000-kW turbo-alternator and condensing plant.

Loans.—Sanction has been received to the borrowing of £2,533 in connection with erection and equipment of a transformer chamber near Hall Lane; and £1,163 for alterations and additions to a transformer chamber in Florence Street. The Electricity Committee recommends further expenditure of £20,000 on extensions of mains, &c.

Change-Over.—The Committee is to change over the system of supply in the Barkerend Road and Leeds Road districts to a.c. at an estimated cost of £9,000.

Burton-on-Trent.—Loan.—The Corporation Electricity Committee is to apply for sanction to borrow £10,000 for the assisted wiring scheme.

Cannock.—Loan.—The Urban District Council has applied for sanction to a loan of £7,500 for the extension of the overhead mains to Penkridge for private and public lighting.

Continental.—Russia.—A message from Leningrad states that the plans for the large hydro-electric power station on the River Dnieper, the Dnieprostroi, have now been completed by the Dnieprostroi Bureau. The plans are for the dams, sluices and buildings, which are to be completed in three years. The Bureau has now started on the working drawings.—*Reuter's Trade Service* (Moscow).

Germany.—The Franken Grosskraft Gesellschaft has recently installed a 100 000 kV h.p. transmission line between its power station at Tullnau and the distribution system in Bavaria. The line, which was constructed by the Siemens-

Schuckert Co. of Berlin, is about six miles in length, and enables the town of Nuremburg to be supplied with electricity from the Bavarian hydro electric power stations.

Spain.—The Barcelona Traction, Light & Power Co., Ltd., is now supplying electricity to 297,547 consumers in the Barcelona district, the energy supplied during the past year amounting to 578,222,973 kW. The capacity of the company's plants has been increased to 235,790 kW, but as this is insufficient to meet the growing demand, arrangements have been made to take an additional 30 million kWh from another company's generating system as from the end of next year.

Derby.—New Plant.—A new 20,000-kW turbo-alternator set, two boilers and a pulverising mill are to be erected at the Corporation electricity works at an estimated cost of £140,000.

East Ham.—Street Lighting.—The Corporation has decided that in future all streets now lighted by gas shall be converted to electricity when the cable is laid.

Epsom.—Loans.—The Urban District Council has applied for sanction to loans of £2,000 for the purchase of domestic electrical apparatus to be let out on hire, and £500 for wiring installations.

Essex.—Institution Supply.—The County Council, instead of installing plant as originally proposed at the Black Notley Sanatorium, has entered into an agreement with the East Anglian Electric Supply Co., Ltd., for the supply of electricity for the new sanatorium at an estimated cost of 3.62d. per kWh.

Gillingham (Kent).—Loan.—The Town Council has applied for sanction to a loan of £20,000 for extending the electricity supply service as far as the present boundary at Wigmore and Hempstead. A further extension will be made to Rainham after the amalgamation of that parish with the borough on April 1st next.

Hull.—Loans Sanctioned.—The Electricity Commissioners have asked for further information regarding the application of the Corporation Electricity Committee for sanction to a loan of £481,500 for power station extensions, but meantime have sanctioned a loan of £250,000 so that the scheme may be proceeded with. The Committee has also received sanction to a loan of £25,000 in connection with the assisted wiring scheme.

Ilkley.—Electrical Development.—At the inauguration of the recent local electrical exhibition, the chairman of the Ilkley Electricity Committee stated that in 1923 the total distribution of electricity was between 400,000 and 450,000 kWh. For the year ended March 31st last the consumption of electricity had increased by nearly a million kWh. The Committee had already been able to reduce the price and also to abolish meter rents.

Inverness.—Year's Working.—At the last meeting of the Town Council it was stated that the total income from the electricity undertaking for the past year was £27,333, and the net surplus was £8,814.

Leeds.—Electricity and Gas Co-ordination.—The City Council has appointed a special sub-committee to consider and report as to the advisability of co-ordinating the work of the electricity and gas undertakings. The proposal was suggested by the chairman of the Electricity Committee, who said the present competition of the two departments would be intensified when the new electrical plant was completed. There were approximately 40,000 houses in the city which had not electricity, whose occupiers wanted it. Over 17,000 people in the last twelve months had asked for electricity in place of gas. He suggested that if the two departments were going to compete for these consumers there would be great waste, and he thought they ought to come to an arrangement.

Liverpool.—Electricity Supply.—The Corporation has received sanction to the laying of additional mains in the Dingle district for changing over the supply from d.c. to a.c. at an estimated cost of £12,147, and the replacement of certain consumers' apparatus at an estimated cost of £2,438; and also for the changing over of supply in the London Road area from d.c. to a.c., and the replacement of apparatus at an estimated cost of £7,124.

The sub-station in Lime Grove, Seaforth, is to be equipped at an estimated cost of £2,000.

At a recent meeting of the Tramways Electric Power and Lighting Committee it was reported that the No. 3 Lister Drive Station would be accepted by the Central Electricity Board as a first-class station for the purpose of the allocation of loads, and the new riverside station at Clarence Dock is to be proceeded with at once. The Corporation will not be called upon to import electricity, but its stations will be connected with other power stations only for the purpose of a stand-by supply.

London.—Westminster.—The City Council Lighting Committee has recommended the renewal for one year of the contract with the Charing Cross Electricity Supply Co., Ltd., for lighting the St. Martin's district and part of the Strand at the existing rate of £42 per lamp per annum (total, £5,208).

Kensington.—The Richmond Road power station of the Brompton & Kensington Electricity Supply Co., Ltd., ceased to generate electricity on October 15th, and a bulk supply from the London Power Co. was inaugurated. According to *The Times*, the new plant is designed for a capacity of 24,000 kVA. At present two 6,000-kVA transformers are installed, and a third, similar, unit will be added shortly. The bulk supply is taken at 20,000 V and stepped down to 2,200 V for distribution to local transformers, which reduce it to the consumers' pressure of 100 and 200 V. The frequency has been changed from 83 to 50 cycles.

Newbury.—Overhead Lines.—The Wessex Electricity Co. is seeking consent to the erection of overhead lines and laying underground mains from Newbury electricity works for the purpose of supplying the village of Cold Ash and also to give a bulk supply of electricity to Thatcham.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Watford.—Lighting: A rebate off the existing charges of 12½ per cent.

Dumfries.—Shop window lighting after closing hours: 4d. per kWh, with a minimum annual charge of 20s.

West Hartlepool.—Domestic rate and business premises: From 1d. to ¾d. per kWh, plus a fixed charge. Two part tariff: The lower rate on the power scale reduced to a flat rate of 1d. per kWh. Public lighting: From 1¼d. to 1½d. per kWh.

Abingdon.—*Abingdon Electric Supply Co., Ltd.*—Lighting: Flat rate, 10d. per kWh; maximum demand rate, a fixed quarterly charge of 7s. 6d. per 100 watts of maximum demand, plus 2d. per kWh; residential subscription rate for dwelling houses with up to 10 assessable rooms, a fixed quarterly charge according to the number of rooms, plus 2d. per kWh. Heating: Flat rate, 2½d. per kWh; sliding scale varying from 10s. per quarter, during the summer quarters, for the first 50 kWh, to 1½d. per kWh for all energy in excess of 100 kWh, and from 20s. for the first 100 kWh per quarter to 1½d. per kWh for all energy in excess of 200 kWh during the winter quarters. Power: Flat rate, 5d. per kWh for the first 100 kWh per quarter and 3½d. for all energy above this amount; sliding scale (unrestricted supply), varying from 20s. for the first 50 kWh per quarter to 1½d. per kWh for over 100 kWh, and (restricted supply) from 10s. for the first 25 kWh per quarter to 1½d. per kWh for all energy above this amount.

Weybridge.—*Urban Electric Supply Co., Ltd.*—Lighting: Winter quarters—10s. for the first 15 kWh per quarter and 8d. per kWh for additional energy; summer quarters—6s. 8d. for the first 10 kWh per quarter and 8d. per kWh for additional energy. Power: First 3,000 kWh per quarter, 3d. per kWh; over 3,000 kWh, 2d. Heating: 2½d. per kWh.

Bethesda.—Power: From 4d. to 2d. per kWh.

Portsmouth.—Domestic (floor area) tariff: Within the city, ¾d. per kWh, outside the city 1d. per kWh; residences of 1,000 sq. ft. and under, the floor area charge to be 8s. per quarter within the city, and 10s. outside. Maximum demand tariff: Within the city ¾d. per kWh, with a minimum charge of 8s. per quarter, and 1d. outside, with a minimum charge of 10s. Prepayment meters: A reduction of ½d. per kWh. Power (outside the city): Varying from 1½d. per kWh for the first 5,000 kWh per annum to 1½d. per kWh for all energy in excess of 20,000 kWh.

Rothesay.—New Plant.—At the last meeting of the Town Council it was agreed to purchase a 300-h.p. generating set at a cost of £5,275.

Spalding.—Loan Sanctioned.—The Urban District Council has received sanction to a loan of £2,939 for the supply of electricity to Crowland.

Stoke-on-Trent.—All-Electric Houses.—The city electrical engineer has reported upon the first completed year's consumption in the eight all-electric houses in Avenue Road, Hanley. The energy consumed was:—Lighting: Average per house, 160 kWh; total, 1,279 kWh. Heating and cooking: Average, 4,440 kWh per house; total, 35,222 kWh. Water heating: Average, 2,985 kWh per house; total, 23,879 kWh. The total cost was £202 15s. 5d., or £25 6s. 11d. per house.

Electricity in Bulk.—The Corporation Electricity Committee has approved terms for a bulk supply of electricity to the Leek Urban District Council.

Torquay.—Loan.—The Town Council has applied for sanction to a further loan of £7,500 for transformers and switchgear for the sub-station at Sidbury.

Wickford.—Electricity Supply Progress.—The Wickford and District Electricity Supply Co., Ltd., reports a considerable increase in the load on its undertaking. Since June this year, the consumers have increased from 170 to 320, and further applications for supply have been received from over 100 more consumers. The maximum load has increased by over 100 per cent. as compared with the 1927 load. The overhead system has been changed from two-wire to three-wire, and completely reorganised by Callender's Cable and Construction Co., Ltd. A new 60-kW set has been put into commission and application has been made for sanction to install additional generating plant to meet the increased demand. The engineer recently appointed is Mr. W. O. Farrow.

Winchester.—Year's Working.—The accounts of the Corporation electricity undertaking (engineer: Mr. R. Ayton) for the year ended March 31st last show a total income of £40,450, as compared with £38,174 in the preceding year. Working expenses amounted to £25,270, as against £24,479, leaving a gross profit of £15,180 (£13,696). After deducting capital charges and expenditure on works of a capital nature there was a net surplus of £3,000, as compared with £853 in 1926-27. The sales of electrical energy increased from 2,138,311 to 2,411,994 kWh, and the maximum supply demanded from 1,098 to 1,372 kW.

Tramway and Railway Notes.

Bradford.—Year's Working.—We have received from Mr. R. H. Wilkinson, general manager of the Corporation tramway undertaking, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total revenue amounted to £597,282, and working expenses were £470,849, leaving a gross profit of £126,433. The figures for the preceding year were: Income, £587,600; working expenses, £476,576; gross profit, £111,024.

The railless-car systems showed a total income of £45,372, as compared with £27,655 in the preceding year. Working expenses amounted to £44,523, as against £30,727, leaving a gross profit of £849, as compared with a gross deficit of £3,072.

The motor-omnibus system and the parcels department showed gross profits of £14,574 and £1,402 respectively, which, with the gross profits from the tramway and railless-car systems, were transferred to net revenue account. After providing for capital charges there was a net surplus for the whole of the undertaking of £28,746, as compared with £7,935 in the preceding year. The capital expenditure during the year amounted to £53,565, and included £19,021 for permanent way, £13,123 for railless cars, and £17,019 for motor-omnibuses. The number of passengers carried increased from 100,763,931 (railless cars, 4,661,704; 'buses, 3,197,951), to 112,367,506 (railless cars, 7,029,025; 'buses, 8,477,742), and the car mileage from 7,580,969 (railless cars 548,793), to 9,411,147 (railless cars, 905,069). The total revenue per car mile fell from 20.564d. to 18.246d.

Chesterfield.—Railless Cars.—The Corporation Tramways Committee has under consideration the extension of the railless-car service to New Whittington.

Continental.—Spain.—The Ministro de Fomento intends to invite tenders shortly for the electrification of from 2,500 to 3,000 km. (1,563 to 1,875 miles) of line on steep inclines in difficult parts of mountains. The work is to be spread over a period of five or six years.—*Reuter's Trade Service* (Madrid).

Switzerland.—In view of the approaching completion of the electrification of further sections of the Swiss Federal railways the authorities are considering the question of the provision of further supplies of power. At present about 317½ million kWh per annum is required, of which 307.4 million kWh is supplied from generating stations belonging to the Federal railway authorities and the balance under contract with various electricity supply undertakings. The question now under consideration is whether it will be more economical to erect further stations on State account or to contract for additional supplies from private undertakings.

Croydon.—Year's Working.—The report of the Corporation tramway manager (Mr. T. B. Goodyer) on the working of the tramway undertaking for the year ended March 31st last shows a total revenue of £110,521, as compared with £120,415 in the preceding year. Working expenses amounted to £123,448, as against £149,596, leaving a gross deficit of £12,927 (£29,181). Capital charges absorbed £37,953, and the final result was a deficit of £50,880, as compared with a loss of £66,339 in 1926-27. The capital expenditure during the year amounted to £34,939, the chief item being £23,973 for cars. The car mileage decreased from 2,473,315 to 2,253,762, and the number of passengers carried from 21,628,570 to 18,670,001.

East Ham.—Tramway Improvement.—The Ministry of Transport has sanctioned the proposal of the Corporation Tramways Committee to double the tramway track in Plashet Grove.

Isle of Thanet.—Tramcars *v.* 'Buses.—The Ramsgate and Margate Town Councils and the Broadstairs Urban District Council are negotiating with the Isle of Thanet Electric Supply Co., Ltd., for the abolition of the electric tramway, and the substitution of motor-'buses.

Leeds.—Track Renewal.—The Corporation Tramways Committee has recommended track reconstruction in Chapeltown Road.

Liverpool.—New Depot.—The Corporation's new tramway works and depôt, which have cost over £400,000, were to be formally inaugurated by Col. Wilfrid Ashley, Minister of Transport, on October 17th.

London.—Collision.—A collision occurred between a motor lorry an a City-bound tramcar in Brixton Road on October 11th. The front of the tramcar was completely smashed, the metal being twisted and the front of the top deck projecting over the lower deck. The driver of the lorry received serious injuries, and five of the passengers on the tramcar were treated at King's College Hospital for cuts from broken glass.

Morecambe.—Abandonment of Tramway.—An Order has been made by the Minister of Transport sanctioning the abandonment by the Corporation of the tramway in Marine Road and Victoria Esplanade.

Sunderland.—Abandonment of Tramway.—The Minister of Transport has made an Order authorising the abandonment of the Corporation tramway in Borough Road, Hudson Road, West Lawrence Street, Lawrence Street, Adelaide Place, the Quadrant, Prospect Row, and Barrack Street.

Telegraph and Telephone Notes.

Belgium.—Telegraph Service.—It has been resolved by the Cabinet to reconstitute the country's telegraph and telephone systems as an independent department, with its own budget, and power, subject to the Government's sanction, to float loans. The new body will take over from the old administration accounts and funds representing the sum of about £30,000,000. Up to 1933 the State will furnish it with the moneys necessary, not to exceed £1,500,000 a year, for extending the field of operations. From and after the year 1933 the department will be expected to pay its way and to hand over to the State 5 per cent. interest on the total amount expended by it since the formation of the department, says the *Daily Telegraph*. Included in the Government programme is the establishment of insurance and reserve funds. All surplus reserve funds over and above £1,000,000 are to be paid over to the State.

France.—Havre Radio Station.—The French Post and Telegraph Authorities recently carried out certain improvements at the marine wireless station at Havre, as a result of which it is now capable of communicating with ships up to a distance of 1,550 miles during the day and over 3,000 miles at night.

Holland.—Herring Fishery.—Ever-increasing numbers of Dutch herring fishing boats are being equipped with simple wireless installations for picking-up wireless broadcast information regarding prices, suitable fishing grounds, metereological reports, &c. Already one-third of the steam and motor luggers are equipped with the necessary receiving sets, the cost of which is small compared with their utility. To judge by the results achieved to date, it is not too much to anticipate that, if not at all, at least the large majority of, Dutch herring fishing boats will be similarly equipped in 1929.—*Reuter* (Amsterdam).

International Telephony.—Ship-shore Service.—An unusual trans-continental telephone call was recently received by a New Eltham resident. When the Blue Star liner *Avelona* put into Lisbon (Portugal) on her outward voyage one of her passengers put through a call to his home in England from the liner's exchange. The boat was connected by a "plug-in" wire with the Portuguese telephone system, and the passenger was at once able to speak from his cabin by the newly opened Anglo-Portuguese telephone cable to New Eltham; reception of the message was perfectly clear. All the Blue Star liners are fitted with apparatus for "plugging in" to the local system at the dockside. The practice is almost universal in North and South American ports, but so far facilities have not been provided generally by the Post Office in British ports.

Spain-U.S.A. Service.—A telephone service between Spain and North America, including Canada, was inaugurated on October 14th, and is soon to be extended to Mexico. The circuit from Madrid, *via* France and the Anglo-American radio link, is 4,836 miles long, and no fewer than 14 amplifier repeaters are used on the European side and 16 on the American.

Irish Free State.—Telephone Kiosks.—The Post Office authorities are about to proceed with a scheme for the erection of at least a dozen telephone kiosks in the streets of Dublin for the use of the public. The booths will be of the sentry-box type.

Radio-Telephony.—Long-distance Call.—A world's record for long-distance wireless-telephone communication was established on October 4th, says *The Times*, by a call between Bandoeng (Java) and Buenos Aires *via* Kootwyk (Holland) and Nauen (Prussia). Although communication was actually established, the experiment was not entirely successful and the trials will be continued.

Transatlantic Telephony.—New Radio Transmitters.—Owing to the growing use of the transatlantic radio-telephone service, the British Post Office and the American Telegraph and Telephone Co. have decided to build additional transmitters. The existing plant provides two speech channels; according to the *Financial News*, it is hoped that a third transmitter may be available for service about July, 1929, and a fourth is under consideration for a later date.

New Cable.—The American Telegraph and Telephone Co. announces that it has perfected a very sensitive submarine cable which will make it possible for the first time to secure effective telephone communication by cable between the United States and England. It is stated that the new cable promises more reliable service than that given by the best wireless methods known. The construction of such a cable for long-distance purposes is under consideration.—*Reuter* (New York).

According to the *Financial News*, Mr. W. S. Gifford, president of the company, states that such a cable, when not being used for telephony, would permit telegraph operation at higher speed than the latest high-speed telegraph cables. This development has been made possible by the use of "Permalloy" and other inventions of the Bell telephone laboratories.

Extension in Canada.—On October 15th the service between England and Canada was extended to all parts of the Provinces of Ontario and Quebec.

Radio Notes.

Canada.—Risk of Shock.—Two or three deaths have occurred in England from electric shock due to radio listeners establishing contact with the domestic lighting circuit while wearing headphones. An interesting case bearing on the responsibility for the electrical faults which make such accidents possible is reported by the *Daily Mail* as follows: Mrs. Joseph Legault, of Lakeside, Ontario, lost her life while listening to a wireless concert. She was using headphones and turned to switch off the light, when a complete circuit was established through the earth lead with a 2,000-volt power line which, experts agreed, was too near the house. She fell dead and her husband on the other side of the room received a severe shock. The municipal electrician of Pointe Claire said that he believed that high winds caused contact between the high-power line and the aerial, thus closing a circuit. Thereupon the jury, in face of the coroner's instructions to return a verdict of accidental death, held the municipality criminally responsible.

Irish Free State.—Development Scheme.—The Dublin wireless exhibition (October 8th to 13th) was opened in the Mansion House by Mr. M. R. Heffernan, Parliamentary Secretary to the Free State Minister for Posts and Telegraphs. It was organised by the Irish Radio Traders' Association, and the goods shown were almost exclusively of British manufacture Mr. Heffernan said their ambition was to bring reception within crystal set range of the greatest possible part of the Free State population. Two possible forms of extension were involved: a number of short-range stations, or a high-power station to serve the whole country. The latter would be the more satisfactory, but they were faced with technical difficulties. He believed, says *The Times*, that the recent conference in Berlin of the International Union of Radiophony had approved the allocation of a wave-length that would suit the high-power requirements. They hoped soon to lay a scheme before Dail Eireann for the future development of broadcasting in the Free State.

India.—Staff's Resignation.—Mr. Eric Dunstan, general manager of the Indian Broadcasting Company, and a number of other European members of the staff have resigned owing to disagreement with the board of directors on questions of policy, says the *Daily Telegraph*. Mr. Dunstan was one of the early members of the B.B.C. staff in London. His efforts to build up a successful broadcasting system in India have been largely hampered by lack of funds.

Television.—B.B.C. Tests.—Following a recent demonstration of the system of the Baird Television Development Co., Ltd., before representatives of the British Post Office, Mr. J. L. Baird demonstrated his apparatus last week before engineers of the British Broadcasting Corporation.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the Electrical Review containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—Melbourne.—Posts and Telegraphs Department. November 27th. Condensers. (B.X. 4753.)* Indicators. (B.X. 4751.)*
November 29th. Telephone apparatus. (B.X. 4757.)*
November 28th. Victorian Railways. One 10-ton overhead electric crane. (A.X. 6951.)*

Bentley.—November 20th. Electric lighting installation for the Middle School. Specifications from Education Department, County Hall, Wakefield.

Canada.—November 19th. City of Winnipeg. Two 10,000-kVA and two 450-kVA generators for Slave Falls, Manitoba. (B.X. 4791.)*

Dundee.—Town Council. Electrical lighting at their Corso Street housing scheme. Particulars from Mr. George Baxter, Director of Housing, 91, Commercial Street.

Egypt.—Ministry of the Interior. November 24th. Electric lighting installation for Sohag. (B.X. 4777.)*

India.—October 26th. Bombay, Baroda and Central India Railway Co. Gasfilled and vacuum lamps. (October 12th.)
India Stores Department. October 24th. Motor generator and switchgear for Delhi Fort. (B.X. 4792.)*
November 15th. Motor alternator set and testing transformer for Government Test House, Calcutta. (B.X. 4790.)*

Irish Free State.—Dublin.—November 5th. Electricity Supply Board. Two 5,000-kVA transformers and switchgear. (October 5th.)
November 3rd. Borough Commissioners. Electric cookers, meter boards, house-service fuses and automatic cut-outs. Forms of tender (5s.) from the City Electrical Engineer.

London.—London County Council.—November 12th. Four electrically-driven centrifugal sewage pumping sets with switchgear, transformers, cables, &c. (October 5th.)
October 23rd. Wiring and fittings for electric lighting in two blocks of tenement dwellings on the East Hill estate, Wandsworth. (October 12th.)
Metropolitan Asylums Board.—October 31st. Automatic telephone installation for High Wood Hospital for Children, Brentwood. (October 12th.)

Manchester.—November 8th. Waterworks Committee. One 400-kW rotary convertor, with transformer, switchgear, cables, &c. Four electrically driven centrifugal pumps, switchgear, pipes, valves, &c. (See this issue.)

New Zealand.—Wellington.—December 20th. New Zealand Government Railways. Sub-station equipment for Frankton Junction power and signalling supply. (B.X. 4771.)*
November 13th. Public Works Department. Transformers. (B.X. 4775.)*

Rochdale.—November 13th. Electricity Department. A.c. single-phase prepayment meters for 12 months. (October 5th.)
November 17th. One 12,000-kVA transformer with boosting transformers and switchgear. (October 12th.)
October 31st. Wiring for a period of 12 months. Engineer and manager, Electricity Works, Dane Street.

South Africa.—Johannesburg.—November 9th. Posts and Telegraphs Department. Wall telephones for the Hillbrow exchange. (B.X. 4709.)
November 15th. Dry cells and voltoids. (B.X. 4729.)*
November 8th. South African Railways and Harbours. Electrically-driven overhead travelling cranes for Pretoria and Pietermaritzburg workshops. (A.X. 6815.)*
November 1st. Town Council. Six induction voltage regulators. (B.X. 4768.)* Transformers. (B.X. 4783.)* Truck-type switchboard cubicles. (B.X. 4782.)* 1,500 pairs of iron-clad cut-outs. (B.X. 4795.)*
Port Elizabeth.—November 8th. City Council. 22,000-V armoured type switchgear. (B.X. 4763.)*
October 25th. Transformers. (B.X. 4760.)*
Durban.—October 26th. Corporation. Ten single-phase and two three-phase transformers for Alice Street power station. (B.X. 4761-2.)*

Stoke-on-Trent.—November 14th. Electricity Department. Overhead wiring services for 64 new houses, Sutton estate, Trent Vale. City Electrical Engineer (£2).

Turkey.—Angora.—October 30th. Direction Générale des Chemin de fer et Ports d'Etat. Overhead electric travelling crane. (A.X. 6954.)*

Tynemouth.—Electricity Department. 250-kVA, three-phase automatic regulating transformer. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Birmingham.—Salvage Committee. Accepted:—
Two electric vehicle batteries.—Tudor Accumulator Co., Ltd.
Tramways Committee. Accepted:—
Thirty double-deck tramcar bodies with top covers.—Short Bros. (Rochester & Bedford), Ltd.
Electricity Committee. Accepted:—
Overhead hand-operated cranes at Sparkbrook sub-station and at Freeth Street sub-station.—Herbert Morris, Ltd.
Installation of vacuum cleaning plant at Nechells station.—British Vacuum Cleaner & Engineering Co., Ltd.

Switchgear for Chester Street sub-station.—A. Reyrolle and Co., Ltd.
Switchgear for Water Street sub-station.—Ferguson Pailin, Ltd.
Switchgear for Sparkbrook and Freeth sub-stations.—General Electric Co., Ltd.
Dismantling existing plant and erection of electrical precipitation plant at Nechells generating station.—Simon-Carves, Ltd.

Education Committee. Accepted:—
Electric lighting installation at Ada Street school.—Ellis & Ward, Ltd. At Gower Street school.—W. J. Sheath.

Boston.—Board of Guardians. Accepted:—
Installing electric lighting at the infirmary and chapel.—G. H. Burton.

Bradford.—Tramways Committee. Accepted:—
20 steel tramcar axles (£114).—Vickers-Armstrong, Ltd.
100 steel tires for tramcar wheels (£315).—Brown Bayley's Steel Works, Ltd.
Electricity Committee. Accepted:—
Erection of two cooling towers at Valley Road power station.—Davenport Engineering Co., Ltd.
High-pressure steam piping for boiler houses.—Brightside Foundry & Engineering Co., Ltd.
Cast-iron circulating water pipes for new pump room.—Stanton Iron Works Co., Ltd.
Two 15-ton cranes and one 10-ton crane.—Herbert Morris, Ltd.
Steelwork for engine room extension.—Frederick Fox, Ltd.
Housing Committee. Accepted:—
Electric light installation at 16 shops and houses on the Swain and Lower Grange Estates (£202).—Mr. J. Carter.

Carlisle.—Electricity Committee. Accepted:—
100 positive plates for battery.—Tudor Accumulator Co., Ltd.

Earby.—District Council. Accepted:—
Cables in connection with the distribution of electricity (£444 per 1,000 yd.).—W. T. Henley's Telegraph Works Co., Ltd.

Epsom.—Urban Council. Accepted:—
Insulating mat for foundations (£800).—English Electric Co., Ltd.

Forfar.—
Electric lighting installation at Forfar Infirmary extensions (£127).—R. Kirkpatrick & Co.

Hull.—Telephones Committee. Accepted:—
Cable.—Power & Lighting Cables, Ltd. (£245).
Lead-in cable.—W. F. Dennis & Co., Ltd. (£77).
Inside wire.—W. T. Henley's Telegraph Works Co., Ltd. (£100).
Bronze wire.—F. Smith & Co. (£295).
Markets Committee. Accepted:—
Electrical installation and fittings at open market £1,051).—H. Smith & Co.

Irish Free State.—Dublin.—Borough Commissioners.
Electric wiring, Crabbe Lane buildings.—Siemens-Schuckert (Ireland), Ltd. (£567). (Accepted.)
The Corporation Electricity Supply Department quoted £680.

—Irish Builder and Engineer.

Leeds.—Electricity Committee. Accepted:—
Cables.—(£4,372), W. T. Henley's Telegraph Works Co., Ltd.; (£5,460), Enfield Cable Works, Ltd.; (£7,308), Macintosh Cable Co., Ltd.

London.—Westminster.—Libraries Committee. Recommended:—
Maintenance of electrical installations at public libraries.—Coleby & Co.
General Post Office.—Accepted:—
32 miles of 160/40 lb. star quad telephone cable.—British Insulated Cables, Ltd.
Metropolitan Asylums Board.—Installation of automatic telephone system at Princess Mary's Hospital for Children:—

V. G. Middleton & Co., Ltd. (Recommended.)	£440
Ericsson Telephones, Ltd.	445
Standard Telephones & Cables, Ltd.	465
Alpha Manufacturing & Electrical Co., Ltd. ...	495
T. Clarke & Co., Ltd.	515
Read & Partners, Ltd.	560
Electrical Contracts and Maintenance Co. (1925), Ltd.	591
L. G. Tate & Co., Ltd.	698
G. E. Wallis & Sons, Ltd.	730
H.H. Electrical Co.	837
Automatic Telephone Manufacturing Co., Ltd.	Informal

Installation of electric lighting apparatus at Colindale Hospital:—

T. Clarke & Co., Ltd. (Recommended.) ...	£1,355
Alpha Manufacturing & Electrical Co., Ltd.	1,495
L. G. Tate & Co., Ltd.	1,590
Jacob, White & Co., Ltd.	1,695
Read & Partners, Ltd.	1,858

St. Pancras.—Contract and Stores Committee.
L.p. cable.—Pirelli-General Cable Works, Ltd. (£1,564); Hackbridge Cable Co., Ltd. (£57); Greenwich Cable Works, Ltd. (£252).

North-Western England and North Wales Electricity Scheme, 1928. Accepted:—
Transformers for Stockport and Poynton (two 10,000 kVA and two 2,500 kVA).—Hackbridge Electric Construction Co., Ltd.

Portland.—Electricity Committee. Recommended:—
Underground cable and overhead line (£6,192).—Pirelli-General Cable Works, Ltd.
Transformers (£1,206).—Yorkshire Electric Transformer Co., Ltd.
Meters (schedule prices).—Measurement, Ltd.

Rugby.—Urban Council. Accepted:—
Cables (£266).—W. T. Henley's Telegraph Works Co., Ltd.

South-East England Electricity Scheme.—Accepted:—
1,300 miles of aluminium strand cable.—British Insulated Cables, Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted:—
Renewal of troughing in two cooling towers (£374).—Davenport Engineering Co., Ltd.

Sunderland.—Corporation.
Consumers' meters.—Ferranti, Ltd.

Forthcoming Events.

Engineering and Scientific Club (Wolverhampton).—Friday, October 19th. 7 p.m. "The Screened Grid Valve." Mr. F. Youle.

Institution of Mechanical Engineers.—Friday, October 19th. Institution, Storey's Gate, S.W. 6 p.m. Presidential address by Mr. R. W. Allen.

Junior Institution of Engineers.—Friday, October 19th. 39, Victoria Street, S.W. 7.30 p.m. "Technical Advertising." Mr. R. E. Sharp.
Friday, October 26th. 7.30 p.m. "Legal Protection for Originality and Invention." Mr. G. W. Tookey.

British Electrical Development Association.—Friday, October 19th. Royal Society of Arts, John Street, Adelphi, W.C. 7.30 p.m. "Organising for Better Selling in Electrical Showrooms." Mr. W. Millner.

Illuminating Engineering Society.—Monday, October 22nd. Chamber of Commerce, Birmingham. 7 p.m. "An Investigation of Electric Lighting in the Engineering Industry." Mr. J. L. R. Cooper.

Electrical Power Engineers' Association (London Local Technical Group).—Tuesday, October 23rd. Junior Institution of Engineers, London, S.W. 7.15 p.m. "Developments in Furnace Construction." Mr. C. H. Sparks.

Institution of Mining Engineers.—October 24th-26th. Burlington House, W. Annual general meeting.

Institution of Electrical Engineers.—Thursday, October 25th. Institution, Victoria Embankment, W.C. 6 p.m. Inaugural address by the president, Lt.-Col. K. Edgcumbe.
(North-Eastern Centre).—Monday, October 22nd. Armstrong College, Newcastle-on-Tyne. 7 p.m. Address by the chairman, Mr. C. W. Salt.
(Mersey and North Wales (Liverpool) Centre).—Monday, October 22nd. The University (Liverpool). 7 p.m. Address by the chairman, Mr. S. E. Britton.
(North-East Centre Students' Section).—Friday, October 26th. Armstrong College. 7.15 p.m. "Post Office Telephones and the Public." Mr. L. B. Harmer.
(East-Midland Sub-Centre).—Tuesday, October 23rd. Derby. 6.45 p.m. "Some Commercial Considerations in Engineering." Mr. J. S. Highfield.

Birmingham Electric Club.—Friday, October 26th. Grand Hotel. 7 p.m. "The Singing Arc," by Prof. W. Cramp.

Faraday House Old Students' Association.—Friday, October 26th. Savoy Hotel, London. 6.30 for 7 p.m. Annual dinner.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

National electric irons.
Apparatus for taking out and replacing lamps on high lighting pillars without using lowering gear or tower wagons. Takes the form of a long pole with clip at top, which can be tightened from the ground.

Notes.

A Large Non-attended Distributing Station.

What is claimed to be one of the largest non-attended electricity distributing stations in the world, capable of supplying the requirements of 300,000 families, was put into service recently in New York City by the New York Edison Company. This station is controlled from another more than three miles away. The switches in the new station are operated by impulse currents sent out from the supervisory station, the operator merely pressing suitable keys. He also receives automatic signals from the new station informing him whether the equipment is functioning properly. Normally the equipment will be inspected only once a week. A complete electrical burglar-alarm system protects the substation building. The control system was devised by the Westinghouse Electric and Manufacturing Co. (America) and adapted for the New York Edison Company by the supply company's own engineers. The new station, which is a tall one-storey building, with base measurements of 125 ft. by 85 ft., receives energy from the generating stations at 13,200 V and distributes it at 2,300 V. The impulses from the distant station are transmitted over telephone wires leased from the New York Telephone Company.

Department of Scientific and Industrial Research.

The Lord President of the Privy Council has appointed Sir David Milne-Watson, LL.D., D.L., and Mr. Robert Whyte Reid, C.B.E., M.I.M.E., to be members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research, in the place of members who have retired on the completion of their terms of office. The Lord President has also reappointed Sir James Hopwood Jeans, D.Sc., LL.D., Sec.R.S., to be a member of the Advisory Council for a further period of one year.

Junior Institution of Engineers.

At the opening meeting of the Winter Session on Friday last Mr. A. J. Simpson gave some interesting details of the equipment of three of the Swiss Alpine Railways, *viz.*, the St. Gothard, the Engelberg Mountain Railway, and the Wengeralp and Jungfraujoch Railway, illustrating the lecture with a number of slides. He said that the majority of the main-line electric locomotives on the Swiss Federal Railways were driven by single-phase motors through transformers on a line voltage of 15,000 V. The average passenger locomotive of 1,350 h.p., weighing 91 tons, was capable of drawing a passenger train of 300 tons at an average speed of 30 m.p.h., or a goods train of equal weight at 22 m.p.h. on a maximum gradient of 26 per cent.; the maximum speed of these engines was 75 m.p.h. The latest type has individual driving by separate motors to each of the four pairs of driving wheels.

Fuel Research.

The Reports of the Fuel Research Board for the year ended March 31st, 1928, and of the Director of Fuel Research were issued recently (H.M. Stationery Office, price 1s. 3d. net). They deal primarily with the physical and chemical survey of the national coal resources, the gas industry, low-temperature carbonisation, and coke. It is remarked that the new plant of Low Temperature Carbonisation, Ltd., at Barnsley, which started work in July, 1927, has a capacity of about 1,000 tons of coke a week; the Maclaurin plant at the Dalmarnock Gas Works has a capacity of about 100 tons of coal a day, and has been running for over two years; there are at least four plants of other types in existence, with a capacity of 100 tons a day, and others are being erected.

The Bergius plant for the hydrogenation of coal at the Fuel Research Station has been working since February, 1927; it has a capacity of about one ton a day. It is considered that the cost of oil obtained in this way on a large scale "would be considerably greater than the price at present ruling for imported oils." Imperial Chemical Industries, Ltd., is experimenting with the process, at its own works.

E.A.W. Activities.

On October 6th, over 30 members of the Surrey Branch of the Association of Teachers of Domestic Subjects visited the Electrical Association for Women's club room and kitchen, 46, Kensington Court, and heard a lecture by Miss Norvick on "Electrical Housecraft"; a cooking demonstration was given by Mrs. M. McNeill Thomson.

A pleasant and informative meeting was held at the home of the Mayoress of Kensington, Mrs. R. Dudley Baxter, on October 8th, when Mrs. Wilfrid Ashley, president of the Association, spoke on the great need for the women of the country to learn all they could about the use of electricity in the home.

The inaugural meeting of the Rugby Branch of the E.A.W. was held on October 11th. Lady Feilding is president of the branch, and Miss N. Pedler hon. secretary.

Embankment Subway Fire Inquiry.

The inquiry into the cause of the recent fire in the subway at Victoria Embankment was concluded on October 10th. The jury found that the fire was due to a L.C.C. cut-out or switch box, and stated that it was not satisfied with the inspection system of the L.C.C. The following rider was added: "We are of the opinion that the London County Council electric lighting system is obsolete and dangerous. It should be replaced by an up-to-date system, thereby eliminating the danger of fire. The London County Council cables should have been overhauled more frequently by an expert after the flooding in January last, as the water affected the cables."

The jury had also inquired into the cause of a cable tunnel fire which occurred on September 30th. Its verdict in this case was that the outbreak was caused by defective insulation of the cable.

Diesel Engine Users' Association.

At a meeting of the Diesel Engine Users' Association on October 12th, Mr. Sterry B. Freeman, C.B.E., read a paper on "Marine Oil Engines." The author remarked that at the moment the centre of interest in the marine world was the struggle between the two fuels—coal and oil. Good overall efficiencies could be obtained from the oil engine or turbine, but the thermal efficiencies were different, and it depended upon what view was taken as to the future ratio of cost between the fuels, whether the purchaser would order oil or steam-driven machinery. "Civil" war was also taking place in the Diesel camp between the four-stroke and the two-stroke oil engine.

Electricity Celebrations at Gravesend.

On Thursday last week the Gravesend Corporation electricity undertaking celebrated the completion of 25 years of successful operation. At the same time some recent extensions were officially inaugurated. The new plant comprises a 5,000-kW B.T.-H. turbo-alternator and two 40,000-lb. boilers by Messrs. Babcock & Wilcox, Ltd. The condensers and circulating pumps were supplied by Messrs. Worthington-Simpson, Ltd. Water for the condensers is obtained from two artesian wells sunk by Messrs. R. D. Batchelor, Ltd., giving 5,000 gal. per minute at an unvarying temperature of 53 deg. F. The borings are claimed to be the largest in the United Kingdom, and on test yielded 7 million gal. per day. Boiler feed water is obtained from an 8-in. bore sunk to a depth of 900 ft. to the lower greensand. The water from this bore requires no treatment whatever, and has practically done away with boiler cleaning. The feed pumps are electrically-driven machines by Messrs. Holden & Brooke, Ltd., while the steam and feed piping was manufactured by Messrs. Aiton & Co., Ltd. In the last ten years the annual sales of the undertaking have risen from 942,200 kWh to 13,878,000 kWh; the number of consumers from 407 to 4,100; and the maximum load from 670 kW to 5,100 kW. In the same period the cost per kWh sold has fallen from 1.25d. to 0.55d., and the charges are among the lowest in the country.

At the power station the Mayor (Ald. J. A. Axcell) unveiled a tablet bearing the names of the Electricity Committee and the electrical engineer (Mr. C. F. McInnes). At luncheon later in the Town Hall, the Mayor presided, supported by the chairman of the Electricity Committee (Ald. Enfield), Mr. Frank Hodges (Central Electricity Board), Mr. W. F. Marchant, O.B.E. (chairman of the London and Home Counties Joint Electricity Authority, and the local member of Parliament, Mr. I. J. Albery. After the loyal toast, Mr. Hodges proposed the toast of "The Gravesend Corporation and the Electricity Undertaking," and in the course of his speech said that after thorough consideration by the Central Board the Gravesend station had been "selected" purely on the grounds of technical efficiency. It was not a large undertaking, but the Board did not consider size alone, and, under the direction of Mr. McInnes the station had shown remarkable results. In responding, the Mayor said that the undertaking had been successful financially ever since its inception. Not only had it not been a burden on the rates, it had actually contributed over £15,000 to their relief. Ald. Enfield, who was the chairman of the original Electricity Committee, and still holds that position, also replied. The toast of "The Contractors" was proposed by Councillor J. W. Clunn (vice-chairman of the Committee) and responded to by Mr. P. E. Rycroft (Messrs. Babcock & Wilcox, Ltd.), and Mr. J. P. Gregory (British Thomson-Houston Co., Ltd.). After the health of the Mayor had been proposed and replied to, the proceedings concluded.

A New Transmission Pole.

For carrying high-pressure and similar transmission lines, Sulzer Gebruder, of Winterthur, Switzerland, have recently brought out a new type of mild-steel tubular pole for which they claim several important advantages over the kinds of mast usually employed. The cross section of the new pole towards the base is oval, and it gradually and regularly decreases towards the top until it terminates in a circular section. The pole is built up of several separate sections, each formed from a single piece of plate cut in the shape of a trapezoid, pressed into a tube of the desired cross section and then welded. Four or five sections are required to construct a pole from 50 to 70 ft. in height. The poles may be used in straight lines and at corners. They are equipped with arms, at a suitable height, made of pressed mild-steel plate welded to steel shoes; these are fixed to the poles by means of stirrup bolts. The top of the pole is closed by a cap which carries the earth line. In order as far as possible to avoid the necessity of carrying out painting and repair work close to the lines, the arms and upper part of the pole are galvanised. The poles are tarred internally by a special process. The

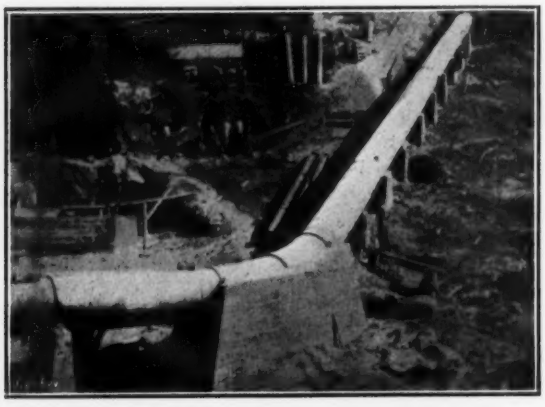
foundations for the poles are very simple and, it is claimed, inexpensive. Each pole is set in a recess in a cement block from 6 to 8 ft. thick, poured directly into a hole dug in the ground, and finally cemented in. The Swiss Federal Railway authorities have adopted the new poles in connection with the electrification of their lines, and the masts are also being used for a 60,000-V transmission line extending over a distance of about 125 miles. It is claimed that the cross-section allows the greatest moment of resistance always to correspond to the line of highest stress.

Appointments Vacant.

Workshop superintendent (£500) for the Telegraph Department Workshops of the Government of Ceylon. Electrician (90s.) for the Tilbury U.D.C. Electricity Department. Electric traction engineer for Messrs. R. White & Partners. Manager and engineer for the Newry U.D.C. Electricity Undertaking (£300). Commercial assistant for the City of Birmingham Electricity Supply Department. Two power station charge engineers and three boiler house charge engineers for the Great Indian Peninsula Railway. (See our advertisement pages to-day.)

An Electrically-welded Pipe-line.

What is believed to be the first completely electrically welded pipe-line to be established in South Africa is that installed in connection with the recently constructed Sabie River hydro-electric power station under a scheme designed and carried out by the Electricity Supply Commission (S.A.). The pressure pipe was designed to carry 70 cusec normally, and 90 cusec on overload. The pipe-line consists of a run of 541 feet without horizontal bends, and a horizontal bend just ahead of the manifold. The internal diameter is 42 in. throughout and the thickness is ¼ in., 5/16 in., and ⅜ in. The pipe is of steel with butt-welded longitudinal joints and is made up in 24-foot lengths. Joints along the run of the pipe are of the butt and strap type, with the straps welded on. Expansion joints of the sliding-sleeve type are provided at four



Section of Electrically-welded Sabie River Pipe-line.

points. Manholes are provided for access to the pipe and an air vent rising above the level in the head box is fitted at the upper end. The accompanying illustration shows a section of the pipe line. The pipe is carried on concrete piers, and is anchored by means of collars and straps attached to heavy bolts carried in the anchor blocks. At the supporting piers the pipe rests on asphalted sheets for reducing the friction when the line expands and contracts. The manifold is provided with three 27-in. branches to the turbine valves and a 12-in. flushing valve at the end. The pipe line, manifold and expansion joints were built locally, and all the welding was done electrically. A pressure test at 160 lb. was satisfactorily carried out on the line after erection. The contractors for the pipe-line were Messrs. Dowson & Dobson, Ltd., and it is interesting to note that for the welding work "A.W.P." electrodes supplied by Messrs. Alloy Welding Processes, Ltd., were used, while the pipe lines were built by the Hydrogen Oxygen and Plant Co., Ltd., at its Johannesburg Works.

Fatality.

William Phillips, employed in painting the transmission-line standards at Catterick Camp on October 4th, touched a "live" wire and received a fatal electric shock.

Legal.

Central Power and Engineering Co. *v.* Adamson.—In the Mayor's and City of London Court, before Mr. Registrar Dell, the plaintiff company, of 146a, Queen Victoria Street, E.C., sued Mr. R. J. Adamson, saw mills proprietor, 42a, Hackney Road, for £7 10s. due under a maintenance contract for attending to the defendant's electric motors.

Mr. H. Strouts, for the plaintiffs, said that the agreement was entered into in April, 1926, for one year, and to continue from year to year, until terminated by two months' notice in writing. The cost of the maintenance was £9 per annum. The first year of the agreement had been carried out, and paid for, but in February, 1928, plaintiffs applied for payment of an overdue amount when the defendant wrote complaining of the way the work was being carried out under the agreement, and requesting plaintiffs to send in their account for nine months' attention. Plaintiffs treated that note as a termination of the contract, and sent the account in. The amount had not been paid, and was now sued for.

Mr. A. G. Gregory, for the plaintiffs, gave evidence of the agreement having been entered into, and produced reports made from time to time expressing satisfaction with the work done by the plaintiffs, and signed by the defendant.

The defendant, in evidence, said that after entering into the agreement it was carried out to his satisfaction for the first three months. Afterwards, he contended, the plaintiffs sent inexperienced men to attend to his electric motors, and they were continually going wrong. He had to employ outside labour to put them in order. He contended that the amount he had paid to the plaintiffs was more than they were entitled to.

The Registrar, in giving his decision, said if he had been satisfied on the evidence that the contract had not been fulfilled he would have had no hesitation in finding for the defendant. He could not, however, come to that conclusion. The plaintiffs had produced reports signed by the defendant expressing his satisfaction, and in answer to the plaintiffs' application for payment of an outstanding balance in February, 1928, defendant wrote "You can send in your account for 9 months' attention." He came to the conclusion that the plaintiffs were entitled to succeed, and gave judgment accordingly for the amount claimed, with costs.

Scammell & Nephew, Ltd., *v.* Attlee & Others.—This case came before the Court of Appeal on Tuesday last on the appeal of the defendants against the decision of Mr. Justice Avory in an action which arose out of the stoppage of the electricity supply to the plaintiffs' works during the general strike of 1926. The defendants were members of the Stepney Electricity Committee at that time, and were held responsible, damages being awarded against them. The appeal, which is proceeding, is on the grounds that there was no evidence in support of the plaintiffs' claim fit to be left to the jury; that the judge was wrong in refusing to leave to the jury the question whether the acts or omissions complained of by the plaintiffs were brought about by *force majeure;* and misdirection by the judge.

Overhead Lines Association.

On Wednesday last week the first social function organised by the Overhead Lines Association took place at the Wellington Rooms, Westminster; it took the form of a reception by the President, Mr. R. Borlase Matthews, and Mrs. Matthews, and the Council, followed by a musical programme and dancing. Amongst those present were Sir Harry Haward (an Electricity Commissioner), Mr. W. M. Mordey, Mr. Frank Gill, Mr. W. M. Selvey, and many other well-known engineers. An interesting exhibition of material for overhead lines was held, at which a great variety of insulators and other pole furniture, stranded cable, outdoor switchgear, bird-guards, &c., was shown, the firms exhibiting being Messrs. S. G. Leach & Co., Ltd., the Key Engineering Co., the Sanca Company, the British Aluminium Co., Mr. F. J. Down, the Greenwich Cable Works, Messrs. Estler Bros., Electric Control, Ltd., General Electric Co., Ltd., and Ebonestos Insulators, Ltd. The Central Electricity Board lent models of its steel towers and an outdoor sub-station for the "grid," and Mr. R. B. Matthews showed the cheap pole described in our issue of July 13th, 1928. The function was very enjoyable and successful. The first meeting of the session was to be held on Wednesday evening last.

London and Home Counties Electricity District.

Following on the practice of the London County Council, the London and Home Counties Joint Electricity Authority has issued a Return relating to electricity generation and supply in the Metropolitan area, giving particulars of all the authorised undertakings in the district and analyses of the accounts and performance in each case. This is the first issue published by the Authority, and covers the periods 1925-26-27 (two years); it follows generally the arrangement of the L.C.C. returns, the last of which related to the year 1924-25. It comprises 81 pages, together with an appendix of 27 pp. giving details of the charges made by each undertaking at July, 1928. The population of the district in 1921 was over eight millions, and the assessable value in 1925-26 was about 76 millions sterling.

In March, 1927, the generating plant installed by municipal undertakings in the District had a total capacity of 470,594 kW, of which 41,547 kW was d.c.; the maximum load recorded during the year was 324,613 kW, and the total connections amounted to 867,488 kW. In December, 1926, the company undertakings in the District had generating plant installed aggregating 633,053 kW, of which 34,065 was d.c.; the maximum load recorded was 460,003 kW, and the total connections amounted to 964,484 kW. Thus the total plant installed in the District amounted to 1,103,647 kW, and the maximum load of all undertakings to 784,616 kW. The aggregate output was 1,280,569,583 kWh in 1926-27, an increase of 16 per cent. on the previous year. The Return will be summarised at greater length in our next issue.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Times states that Mr. P. J. Pybus is recommended for adoption as prospective candidate by the Executive Committee of the Harwich Division Liberal and Radical Association.

At the request of the Institution of Electrical Engineers, the Torquay Town Council has given its sanction to the placing of a brass memorial tablet to the memory of the late Mr. Oliver Heaviside (who was a native of the town) in the Marble Hall of the Municipal Buildings.

Last week the Hull City Council appointed Mr. J. N. Waite, of Bradford, city electrical engineer, at a salary of £1,300, rising to £1,500, in succession to Major Bell, who has become engineer and manager of the Glasgow Electricity Department. After a five-years' apprenticeship in mechanical engineering, Mr. Waite spent two years in the traction power station at Stoke-on-Trent. He then went to the Newcastle-upon-Tyne Electric Supply Co., Ltd.; he remained with that company for 13 years, during which period he held successively the following positions:—Junior assistant engineer; assistant to Mr. W. M. Selvey in special test and research work; charge engineer at the Philadelphia power station; control engineer; chief assistant, steam section testing department; and chief assistant, economy section, operating department. The last two positions were held conjointly. Mr. Waite was then appointed chief assistant engineer in the Stoke-on-Trent Electricity Department. He held that position for six years and left about ten months ago to become deputy city electrical engineer of Bradford. Mr. Waite has made a number of contributions to power station literature, including "Factors Affecting Power Station Efficiency"; "Dew Point Temperature of Flue Gases"; "River Water or Cooling Towers?"; "Performance Guarantees for Power Plant with Reference to Official Acceptance Test"; "Power Station Progress," &c.

Mr. J. N. Waite, M.I.E.E.,

Who has been appointed City Electrical Engineer of Hull.

The Rev. W. T. Harrop, who recently resigned the post of claims superintendent in Bolton Tramways Department to join the Church of England ministry, received a pocket Communion set in solid silver, and a fountain pen and propelling pencil from the staff and employés on October 10th.

Sir Gilbert C. Vyle, of Messrs. W. & T. Avery, Ltd., was on October 11th elected president of the British Engineers' Association.

Mr. James Dudlestone, the retiring traffic superintendent of the Birkenhead tramway and motor-bus undertaking, has been presented by the staff with an armchair and a four-valve wireless set. Mr. Dudlestone has been associated with the undertaking for over 50 years.

Mr. M. Clissold, for five years branch manager at Melksham of the West Wilts Electric Supply Co., Ltd., who is leaving the district, has been presented by the staff and employés with an inscribed clock.

The Torquay Town Council has appointed Mr. H. F. Hudson, Bradford, as meter superintendent in the Electricity Department at a salary of £318 per annum.

The Ashford (Kent) Urban Council has increased the salary of its electrical engineer to £600 as from October 1st.

Mr. A. H. Jackson, showroom superintendent at West Hartlepool Electricity Department, has been appointed hired apparatus superintendent under the Worksop U.D.C. Electricity Department.

Mr. Norman Foster Wilson, who has accepted the Mayoralty of Kendal, is chairman of Messrs. Gilbert Gilkes and Co., Ltd., turbine makers, of which he became joint managing director at the age of 25. He is chairman of the Electricity Committee.

The Carlisle Electricity Committee has increased the salary of the assistant electrical engineer, Mr. Baynham, from £599 to £636 per annum, with effect from June, 1927.

Mr. C. W. Reeve, having resigned his position as chief stores superintendent to the Underground group of companies, to take up the position of assistant to the chairman of the Associated Equipment Co., Ltd., Mr. R. H. Pitts has been appointed chief stores superintendent in his place. Mr. G. W. Duncan has been appointed staff officer to succeed Mr. Pitts.

The *Daily Telegraph* records that Mr. and Mrs. C. F. Vennedt celebrated their diamond wedding on October 11th. Married in Denmark 60 years ago, they have spent 52 years in North London. Mr. Vennedt, who is 85 years of age, was a telegraphist in the German-Danish war of 1864. Our contemporary states: "When the Great Northern Telegraph Company was formed in 1869 to operate the cables between Denmark, Norway, England, and Russia, Mr. Vennedt was specially selected to improve signal speed between England and Denmark, and, going to Newcastle for that purpose, remained as head of the original operating staff. In 1870 he introduced the then newly developed Wheatstone automatic instruments at the company's station at Libau, Russia. After holding other posts he was appointed superintendent of the London station, which post he held until his retirement in 1914. On the outbreak of the Great War just afterwards, however, he resumed work for a further period of eight years with the company. In 1909 the King of Denmark made him a Knight of the Dannebrog."

Mr. D. S. Baddeley, of 62, Robertson Street, Glasgow, late Scottish representative of Messrs. Crompton Parkinson, Ltd., has been appointed representative for the whole of Scotland for the sale of Macfarlane dynamos and motors of all kinds.

At a smoking concert recently held at Cardiff by the staff of the South Wales District of the Post Office Engineering Department, Mr. Henry Wilson, M.I.E.E., who retired recently from the position of superintending engineer, was presented with a mahogany grandfather clock and a gold watch. Mr. J. H. Haynes, assistant superintending engineer, presided, and advantage was taken of the occasion to extend a welcome to Mr. J. Sinclair Terras, of Preston, who has succeeded Mr. Wilson in charge of the district. Mr. Wilson has joined the firm of Mr. T. Watson, scientific instrument maker, 70, Dudden Hill Lane, N.W.10.

The Lowestoft Corporation Electricity Committee has increased the salary of Mr. May, the electrical engineer, from £600 to £750 per annum.

Mr. F. J. Bird, station superintendent for the past seven years to the Nuneaton Borough Electricity Department, has resigned that position, having been appointed generating engineer to the Halifax Borough Electricity Department.

Mr. E. G. C. Saunders was presented by the staff and workmen of the South Shields Corporation Electricity Department with a solid silver cigarette case on leaving to take up an appointment to the Southport Corporation as shift engineer. Mr. James Edgar, borough electrical engineer, made the presentation.

Mr. H. B. Woodford, secretary to the Shanghai Municipal Electricity Department, retired on August 31st, after 21 years' service with the Department. Mr. H. Gordon Wright, assistant secretary, has succeeded him. Mr. Wright has been connected with the electricity supply industry since 1901, having previously served with the Newcastle & District Co. and the Greenock and Edinburgh Corporation Electricity Departments, prior to taking up duty at Shanghai in February, 1920.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Celebritone, Ltd.—Public company. Registered October 12th. Capital, £160,000 in 2s. shares. The objects are to adopt an agreement with the Shaftesbury Distribution Co., Ltd., to acquire the registered trade mark "Celebritone" No. 491,264 in Class 8, and to carry on the business of manufacturers of and dealers in electrical reproducing gramophones, combined radio and gramophone instruments, wireless sets, &c. The minimum cash subscription is seven shares. The directors are:—J. de C. Hamilton, 5, Dawson Place, Bayswater, W.2 (director Army & Navy Co-operative Society, Ltd.); Sir Edgar J. Holberton, 4, Sloane Gardens, S.W.1 (director Duophone (Foreign), Ltd.); W. Goldie, Dashwood House, Old Broad Street, E.C. (director Duophone & Unbreakable Record Co., Ltd.); R. L. Hawkesworth, 5, Davies Street, W.1 (director Union Securities Co., Ltd.); S. Harris, Highfield, Antrim Road, N.W.3. Solicitors: Soames, Edwards & Jones, Lennox House, Norfolk Street, W.C.2.

Accumulators of Woking (1928), Ltd.—Private company. Registered October 10th. Capital, £10,000 in £1 shares. Objects: To acquire the factory and freehold premises at Woking, formerly carried on by Accumulators of Woking, Ltd., and later by the receiver for the debenture holders, to adopt an agreement with D. M. Robertson and G. B. Page, and to carry on the business of mechanical, electrical or automobile engineers, &c. The first directors are:—D. M. Robertson, Waters Edge, Alton, Hants, engineer (chairman); G. B. Page, Woolmer Lodge, The Forest, Liss, Hants, engineer; H. T. Witt, 5, Chancery Lane, W.C.2, chartered accountant (life directors). The Westminster Bank, Ltd., shall be entitled to nominate a director so long as any moneys are owing by the company under any debentures issued to the bank, H. T. Witt being the first nominee. Registered office: Maybury Hill, Woking.

Earlsdon Radio Supplies, Ltd.—Private company. Registered October 10th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers, merchants, factors and selling agents of radio, electrical, and other articles, &c. The first directors are: Mrs. J. Dumont, 3, Abbott Street, Lincoln; J. E. Sills, 221, Burton Road, Lincoln, insurance inspector; J. W. Screeton, 316, Lincoln Road, Peterborough, cycle and wireless dealer (all permanent). Secretary: Mrs. J. Dumont. Registered office: 25, William Street, Newark-on-Trent.

Richmore Valve Co., Ltd.—Private company. Registered October 10th. Capital, £400 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio valves, electric lamps, &c. The subscribers (each with 100 shares) are: V. M. Richmond, Conway, Burman Road, Shirley, Birmingham, and H. T. Livermore, 371, Green Lane, Small Heath, Birmingham, radio valve manufacturers. V. M. Richmond signs documents as director. Registered office: 182, Miller Street, Aston, Birmingham.

Orchorsol Gramophones, Ltd.—Public company. Registered October 11th. Capital: £120,000 in 1s. shares. Objects: To adopt an agreement with the Unicorn Trust, Ltd., and to carry on the business of manufacturers and factors of, agents for, and dealers in gramophones, telephones, and other machines and apparatus for recording, reproducing, or transmitting music, speech or sound, electrical, wireless or television apparatus, apparatus for synchronising sound with kinematograph films, &c. The subscribers (each with one share) are: L. E. Skan, "Clevedon," 27, Windsor Road, Worthing, law student; H. E. Skan, 4, Copthall Chambers, E.C.2, solicitor; P. H. Brashier, 4, Copthall Chambers, E.C.2, solicitor, and four clerks. Registered office: 639-643, Salisbury House, London Wall, E.C.2.

J. H. Key, Ltd.—Private company. Registered October 6th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical and wireless apparatus of all descriptions, hardware dealers, electricians, &c. The subscribers (each with one share) are:—G. H. Jones, 159, Woolstone Road, Forest Hill, S.E.23, clerk; P. J. Hedges, The Briars, Southend Road, Hockley, clerk. Solicitors: Peter Thomas & Clark, 1, Bush Lane, Cannon Street, E.C.2.

Vellum Lamp Shades, Ltd.—Private company. Registered October 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of makers of and dealers in lamp shades and vellum goods, house furnishers and decorators, fittings makers, electricians, &c. The subscribers (each with one share) are:—Sarah E. Ramsdale and E. D. K. Ramsdale, 14, North Villas, Camden Square, N.W.1, lampshade manufacturers. Registered office: 19, Rathbone Place, W.1.

Electrical Automatics, Ltd.—Private company. Registered October 8th. Capital, £500 in £1 shares. Objects: To adopt an agreement with W. P. Ballinger, and to carry on the business of makers of and dealers in automatic and other similar machines, electrical or otherwise, &c. The directors are:—R. R. Shankland, 91-3, Bishopsgate, E.C.; W. P. Ballinger, address not stated; H. J. Shepard, 40, Chancery Lane, W.C.2. Solicitor: H. J. Shepard.

Electric Store, Ltd.—Private company. Registered October 6th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and factors of all classes of electrical goods, wireless receivers and instruments, &c. The subscribers (each with one share) are:—H. Fensley, Down Hall Road, Rayleigh, architect; Dorothy Halsey, "Kerthfield," Southchurch Road, Southend-on-Sea, secretary. Registered office: 6, Southchurch Road, Southend-on-Sea.

Official Returns of Electrical Companies.

Radia Electric Co. (Gloucester), Ltd.—Particulars filed of £5,000 debentures authorised September 29th, 1928, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £10.

Radio Service (London), Ltd.—Satisfaction to the extent of £125 on September 15th, 1928, of debentures dated July 25th, 1927, securing £2,750.

Rhayader Electric Light and Power Co., Ltd.—Issue on September 13th, 1928, of £675 debentures, part of a series.

Burgoyne Manufacturing Co., Ltd.—E. D. Hine, Abbey House, Victoria Street, S.W.1, was appointed receiver and manager on October 1st under powers contained in debenture dated August 28th, 1928.

Short Wave Communications Development Co., Ltd.—H. T. Woodward, 19, Valetta Road, Acton, W.3, was appointed receiver and manager on September 29th, under powers contained in debentures dated February 2nd, 1928.

Bartrum, Roylance & Co., Ltd.—Particulars filed of £1,181 5s. 4d., debentures authorised September 10th, 1928, and covered by trust deed of that date charged on the company's property, present and future, including uncalled capital, the whole amount being now issued. Trustee: W. S. Cunliffe, 40, King Street, Manchester.

Metropolitan-Vickers Electrical Co. (Mediterranean), Ltd.—Capital, £1,000 in £1 shares. Return dated November 15th, 1928. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Paramount Wireless Co., Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1927 (filed March 14th, 1928). All shares taken up. £500 paid. Mortgages and charges, nil.

Madras Electric Supply Corporation, Ltd.—Capital, £800,000 in 473,200 ordinary and 326,800 preference shares of £1 each. Return dated July 4th, 1928. 436,800 ordinary and 326,800 preference shares taken up. £657,600 paid on 384,000 ordinary and 273,600 preference shares, £106,000 considered as paid on 52,800 ordinary and 53,200 preference shares. Mortgages and charges: £187,000 7 per cent. second (reg.) debentures.

East Anglian Electric Supply Co., Ltd.—Capital, £250,000 in £1 shares (40,000 preference and 210,000 ordinary). Return dated May 16th, 1928. 2,581 preference and 210,000 ordinary shares taken up. £34,669 paid (being £1 per share on 122 preference and 23,297 ordinary, and 1s. 6d. per share on 150,000 ordinary shares), £39,162 considered as paid on 2,459 preference and 36,703 ordinary shares. Mortgages and charges, nil.

Mullard Wireless Service Co., Ltd.—Capital, £10,000 in £1 shares (5,000 "A" and 5,000 "B"). Return dated May 8th, 1928. 4,600 "A" and 4,600 "B" shares taken up. £460 (1s. per share) paid. Mortgages and charges, nil.

Wholesale Electric Lamp Co., Ltd.—Capital, £1,500 in £1 shares. Return dated July 4th, 1928. All shares taken up. £1,500 paid. Mortgages and charges, nil.

Fox & Offord, Ltd.—Particulars filed of £5,000 debentures authorised September 22nd, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Foster & Pullen, Ltd.—Satisfaction in full on September 20th, 1928, of first mortgage debenture dated November 18th, 1920, securing £500.

Nelson Electric Co., Ltd.—Issue on September 27th, 1928, of £400 debentures, part of a series already registered.

City Notes.

Stock Exchange Notices.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

British Columbia Power Corporation, Ltd.—240,000 Class "B" shares of no par value.

Cawnpore Electric Supply Corporation, Ltd.—40,000 7 per cent. cumulative preference shares of £1 each fully paid, Nos. 198,508 to 238,507; 40,000 ordinary shares of £1 each, fully paid, Nos. 160,001 to 200,000.

International Combustion Engineering Corporation.—1,001,113 common shares of no par value.

Application has been made to the Committee to allow the following to be officially quoted:—

East African Power & Lighting Co., Ltd.—270,000 ordinary shares of 20s. each, fully paid, Nos. 1 to 270,000, and 270,000 7 per cent. cumulative preference shares of 20s. each, fully paid, Nos. 1 to 270,000.

Marconi's Wireless Telegraph Co., Ltd.—146,359 ordinary shares of £1 each, fully paid, Nos. 3,248,821 to 3,395,179.

New Issue.

Mersey Power Co., Ltd.—On Tuesday last a prospectus was issued by this company offering for subscription 400,000 6 per cent. cumulative preference shares of £1 each at par. This is part of an authorised amount of £550,000; the company also has £350,000 of issued ordinary capital and an outstanding loan capital of £753,578. The company's generating station at Runcorn has a capacity of 37,500 kW; the station has been "selected" by the Electricity Commissioners, and the installation of two 50,000-kW sets is contemplated. Last year's sales of energy totalled 65,585,424 kWh. The company has bulk supply contracts with the North Wales Power Co. and the Mid-Cheshire Electricity Supply Co., Ltd. The proceeds of the present issue are to be devoted to the repayment of £257,103 Government mortgage, the balance being used for the general purposes of the company.

Ruths Steam Storage, Ltd.

At an extraordinary meeting on October 11th a proposal to raise the capital to £500,000 by the creation of 200,000 "A" shares of £1 each was approved. The chairman (Mr. F. E. Powell) explained that separate companies were to be formed in the United States and Canada to take over the rights for those countries. At present only 150,000 of the new shares would be issued: 70,000 to existing shareholders at 25s. per share; 60,000 to important groups at the same price; and 20,000 were being reserved for a strong industrial group whose interests were reciprocal to their own, which would provide a sales outlet of the highest importance. Valuable orders had been received, and they were expecting a considerable increase in the near future. The possibilities in India, Australia, New Zealand and South Africa were not being neglected.

Marconi's Wireless Telegraph Co., Ltd.

In our last issue we recorded the formation of a committee for the purpose of protecting the interests of the holders of the company's £1 ordinary shares in the event of a merger with the cable companies. It was announced later that a similar committee had been formed on behalf of the holders of the 7 per cent. cumulative participating preference shares. The committee consists of Sir Richard Davies, C.B.E., Mr. F. P. Robjent, Mr. H. Guedalla, and Mr. A. Kohnstamm, with Mr. Bernard Wicks as secretary.

Whitehall Electric Investments, Ltd.

The directors state that a provisional agreement has been entered into with the Electric Bond & Share Co., New York, for the sale of the company's holdings in companies operating in Chile and Mexico at a figure substantially in excess of that at which the investments stand in the balance sheet. The directors also propose, when the new Companies Act comes into force, to suggest to the holders of the preference shares that their holdings shall be converted into shares of the nominal value of 20s. each, redeemable at 25s. at any time or upon liquidation.

British Columbia Telephone Co.

The operating revenue for the year ended March 31st last was $4,317,212, and after providing for operation, depreciation, maintenance, and employés' benefit fund, there was a balance of $933,881. The allocations include $315,000 for ordinary dividend and $307,500 for preference and preferred dividends, and a balance of $88,956 is transferred to surplus.

Stothert & Pitt, Ltd.

The accounts for the year ended June 30th last show a profit of £30,364; in 1926-27 there was a loss of £5,814. A dividend of 6 per cent. (against *nil*) is recommended on the ordinary shares and £13,500 is transferred to reserves.

Ever-Ready Co (Great Britain), Ltd.

Mr. Magnus Goodfellow, managing director of the company, has been appointed chairman in the place of the late Mr. C. H. Moller. Mr. F. S. Johnson, who has been with the company for many years, has been appointed to the board.

Anglo-American Telegraph Co., Ltd.

Dividends of £1 10s. per cent. on the preferred stock and 15s. per cent. on the ordinary stock have been declared in respect of the quarter ended September 30th.

National Telewriter Co., Ltd.

The profit for the year ended June 30th last, after paying debenture interest, was £1,254 (against £1,379). A dividend of 1 per cent. is recommended on the preferred ordinary shares, as last year.

Para Electric Railways and Lighting Co., Ltd.

A dividend at the rate of 3 per cent. has been declared on the 6 per cent. cumulative preference shares on account of the year ending November 30th.

Isle of Wight Electric Light and Power Co., Ltd.

An interim dividend at the rate of 8 per cent. per annum, free of tax, has been declared on the ordinary shares (as last year).

Indo-European Telegraph Co., Ltd.

An interim dividend at the rate of 5 per cent. per annum, free of tax, has been declared.

Brazilian Traction, Light and Power Co.

A quarterly dividend of 44 cents per share has been declared on the ordinary no-par-value shares.

Callender's Cable and Construction Co., Ltd.

An interim dividend of 5 per cent. has again been declared on the ordinary shares.

German Companies.

The *Rheydt Cable Works Company* records net profits of 1,020,000 marks, as compared with 970,000 marks. The dividend is maintained at 12 per cent.

The *Rhenish Westphalian Electricity Works Company*, Essen, reports that the sales of energy rose from 1,246,315,232 kWh in 1926-27 to 1,448,499,848 kWh last year. The net profit is 15.33 million marks, as compared with 13.69 millions, and the dividend is 9 per cent. on the increased capital of 155,000,000 marks.

The *Electricity Company (late W. Lahmeyer and Co.)*, Frankfort-on-Main, states that the constructional department was well occupied during the whole of 1927-28, and is also now provided with orders for a long time forward. Among them is one for a new steam power station for the city of Memel. The overhead line department is making considerable parts of the 220,000-V North-South transmission line to connect the works of the Westphalian Electricity Company with the Vorarlberg hydro-electric works. The accounts show a net profit of 2,033,000 marks, against 2,011,000 marks, and the dividend remains at 10 per cent.

French Companies.

The *Société la Maison Breguet* records an increase in the net profits from 8,148,000 fr. in 1926-27 to 9,147,000 fr. in the past year and the dividend is proposed to be raised from 40 fr. to 50 fr. per share.

The *Société des Accumulateurs Electriques (Dinin)* reports net profits of 6,682,000 fr. for 1927-28, as compared with 4,258,000 fr. It is proposed to raise the dividend from 22 fr. to 30 fr. per share.

The *Société d'Electro-Metallurgie de Dives* records net profits of 20,504,000 fr. for 1927-28. The dividend is 125 fr. per share gross, as against 115 fr.

Austrian Company.

The *Electric Glow Lamp Works "Watt,"* Vienna, proposes to pay 8 per cent. for 1927 on the share capital of 1,000,000 schillings, as compared with 6 per cent. in the previous year.

Dutch Company.

It is reported from Amsterdam that at the general meeting of the *N.V. Philips Gloeilampenfabrieken* on October 22nd a proposal will be submitted for raising the share capital from 40,000,000 fl. to 100,000,000 fl.

Swiss Companies.

The *Elektra Applied Electricity Company*, Zurich, reports for its first year of activity (1927-28) a net profit of 920,000 fr.; the dividend is to be 5 per cent. on the ordinary capital. It is proposed to increase the share capital to 30,000,000 fr.

The *Motor-Columbus Company for Electrical Undertakings*, Baden, reports participation in new and promising undertakings. In April last the company co-operated in the formation of the Swiss-American Electricity Company of Zurich; this will enable the company to place considerable funds at the disposal of its South American undertakings for their extension. The net profit amounts to 8.244,000 fr., as against 6,592,000 fr.; the dividend is maintained at 10 per cent.

The report of the *Bank for Electrical Undertakings*, Zurich, 1927-28, states that the financial position of the bank has been materially influenced by the share capital increase of 23.50 million fr. to 70 million fr. The net profit increased from 6.40 million fr. to 9.66 millions, permitting of the maintenance of the dividend at 10 per cent. on the larger capital.

Stocks and Shares.

Monday Evening.

Stock Exchange markets remain active, and although it is evident that the public are moving more cautiously than they were in the matter of gambling counters, the fact remains that animated speculation is noticeable in practically anything which holds out the possibility of buyers securing a quick turn. People nowadays are more anxious than ever they were before to obtain money by turning over shares, rather than by the more humdrum process of receiving dividends; but, in spite of this, the sound securities are far from being neglected. Reference to our own column of share prices gives weekly evidence of the demand that there is for shares, *e.g.*, in the electrical manufacturing group, while in the gilt-edged departments, although a good deal is heard of people selling War Loan, lands and houses, &c., in order to buy gramophone record, coal distillation and other such speculative shares, the prices of the good-class stock make steady upward progress.

The Marconi Uncertainty.

It is surprising how widely spread is the interest now taken in the Marconi position. Committees have been formed to look after the interests of the preference shareholders, and of the holders of the £1 shares. The £1 shares continue to be a centre of lively discussions as to what the position may be under the merger proposals. There is no need to re-traverse the ground of the various contentions which have already been set out here, but the speculators who are buying the Marconi £1 shares maintain that, whatever the legal rights of the shares may prove to be, the general interest of the Merger Companies will be best served by getting rid of the uncertainty by giving the £1 shareholders rather more, if necessary, than they are actually entitled to. As nobody can tell at present what the latter is, this last argument calls for no particular comment, but it serves to show the kind of basis upon which speculation is willing to take an interest in anything offering a chance of a profit. The price of Marconi 10s. shares has eased off to 73s. 9d., while the £1 shares, after marking as high as 5, receded to 4¾d. We have had inquiries, it may be interesting to observe, during the past few days, from a little hamlet in Switzerland, and from a merchant in Constantinople, as to what is the position of the Marconi Company, a sidelight upon the remarkably widespread character of the interest taken in the concern and its finances.

Marconi Marine.

Marconi Marines at 53s. ex dividend are slightly lower on the week. The directors, in declaring the increased dividend of 7½ per cent., gave the impression that the final dividend would be also 7½ per cent., to make 15 per cent. for the year. This led to the disappointment that caused dulness in the price of the shares, but there seems to be a doubt as to whether the dividend for the year may not prove more substantial. Canadian Marconis, after being dull at 28s., hardened to 30s. on renewal of buying from the Dominion.

Cable Stocks.

Deduction of dividends from Eastern Telegraph ordinary stock and Eastern Extension shares, had the effect of stiffening the prices to some extent. The improvements were lost later on, and the movements, on the week, are unimportant. The course of the Eastern quartette is swayed to some extent by the manner in which Marconis move. Interest is keyed up to a high pitch in regard to what the next developments are likely to be, and, except for an occasional bout of profit-taking, the market remains good. Other cable stocks are rather neglected, and no changes of consequence have occurred. We mentioned last week that the Oriental Telephone Company, in announcing its usual 4 per cent., tax free, interim dividend, stated that ordinary shareholders of January 1st next will be given the right to subscribe at par for one new ordinary share for every three ordinary then held. On this, the old shares moved up to £3 ex dividend, the bonus being substantial. The previous price of the shares, compared with the dividend paid, indicated that anticipation had looked for something of this kind to come about.

Home Electricity Supply.

County of London are 3s. higher at 41s., providing the principal feature in their group this year. Vague gossip has been in circulation to the effect that a "melon" of some kind is to be cut, or that a new issue at a cheap price is pending. No definite news, however, has reached the market. Bournemouth & Poole at 3¼ have gained the fraction. London Electrics are 6d. back, at 27s. Midland Counties Electric drooped to 30s. 6d.: Scottish Power improved to 33s. Electric Supply Corporations are being persistently bought, and at 58s. 3d., mark 1s. 8d. rise, making 5s. within a fortnight. Isle of Thanet ordinary are 37s. and the preference 28s. Egham and Staines remain about 34s. 9d., and North Metropolitans are 51s.

Home Rails.

The revival in Home Railway stocks proved to be of very brief duration. A batch of disheartening traffic figures served to knock the courage out of the market. The recent accidents caused selling of the main-line stocks. Prices went back with a run. Underground Electric ordinary sympathised with a 1s reaction to 26s., and the income bonds fell 3 points to 125. The only improvement is a gain of 1 in Central London ordinary, raising the price to 73. No nominal movements occurred in the list of London traction issues, but London United Tramways 4 per cent. debenture has changed hands as high as 62. There is no large floating supply of stock available in the market.

The Sale of Whitehall Investments.

Whitehall Electric Investments Company issues an interesting statement to the effect that a provisional agreement to sell its holdings in the companies operating in Chile and Mexico has been entered into with the Electric Bond and Share Company of New York. There are no ordinary shares in the market, so that the matter is one of more academic than financial interest. The price of the preference shares is a trifle harder at 24s., and the debenture is 102. Preference shareholders will have the right, if the directors' suggestions go through, to convert their shares, so that the latter will be redeemable at any time at 25s. per share, or, on liquidation, at the same price, instead of 20s. as at present. The American Company is paying more than 10¼ million pounds sterling for the Whitehall Electric Investments' securities, and interest is piqued on the point as to what the Whitehall will do with so large a sum. Market gossip hints at the possibility of the Pernambuco Tramways & Power Company being an object of desire to the Electric Bond & Share Company. The £1 ordinary shares of the Pernambuco Tramways have not yet received a dividend, and are priced at 9s. 3d. in the market. La Plata Trams stand at half-a-crown.

Electrical Jeremiads.

Shares in the companies connected with the electrical manufacturing and distribution industrials are not affected by a somewhat depressing report from the B.E.A.M.A. The Economic and Statistical Department of the Association quotes a declining ratio of expansion this year in the normal rate of electrical power production, and terms this unsatisfactory, in view of the national scheme's initiation. The falling-off is attributed to intensified trade depression, and "there are few indications of recovery," states the report. The areas of the North-East Coast and Sheffield and the West of Scotland are the two exceptions to a rule otherwise general. The export outlook is hopeful, but profit-margins have practically disappeared because of German and Swiss competition. Share values, however, have suffered not at all in the face of this lugubrious recital.

Cable Construction.

British Aluminium continue to give way, and are another 1/16 lower at 45s. English Electrics came into speculative demand, with a rise to 7s. 6d., and Crompton Parkinson's preferred strengthened to 19s. The latter company's 5s. ordinary shares are on the point of being introduced; dealings are expected to start at a pound to a guinea. Cable construction shares show marked strength, Enfields being a feature with a 3/16 rise to 96s. 3d. Johnson & Phillips are similarly better at 41s. 3d. Callender's are up to 85s. The B.E.A.M.A. report, just mentioned, pointed out that the orders placed by the Central Electricity Board have brought relief to the cable manufacturing and transformer branches of the industry, allowing them to maintain a high level of production.

Dollar Stocks, and Others.

While Mexicans are unaltered, Brazilian Tractions rose a point, to 62¼. Shawinigan Water fell back to 91. The market in Hydro-Electrics is quiet at 31½, International Holdings being 14½. Bullish fervour in the United States and in Canada appears to be a little dimmed. A rally in the price of raw rubber has produced a demand for rubber shares, and the market gives signs of reviving. Ruths Steam Storage have been a feature of strength in their own department. The iron and steel group remains firm, and comparison of to-day's prices with those of a few months ago is interesting in its exhibition of the substantial recoveries that have occurred.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	Dividend. 1927.	Price Oct. 15, 1928.	Rise or fall.	Yield. p.c.
Home Electricity Companies.	£					
Bournemouth and Poole	1	14†	15	3⅛	+⅛	... ...
Brompton Ordinary	1	8½	8½	27/-	—	5 3 8
Charing Cross Ordinary	1	8½	8½	27/-	—	5 3 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8½	8½	27/6	—	5 1 10
City of London	1	10	10	33/3	—	4 4 4
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Clyde Valley	1	8	8	2	—	4 0 0
County of London	1	7½	7½	41/-	+3/-	3 13 2
do. do. 6% Pref.	1	6	6	23/6	—	5 2 2
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	58/3	+⅛	3 15 7
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	31/-	+6d.	4 16 9
London Electric	1	8½	8½	27/-	—6d.	5 3 8
Metropolitan	1	8	9	47/-	—	3 16 9
do 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/6	—6d.	4 5 3
Mid. Elec. Power	1	—	15	40/-xd	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	27/6	—	4 7 5
do. 7% Pref. ...	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10⅝	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	23/-	—6d.	5 4 4
St. James' and Pall Mall	5	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	33/-	+6d.	4 17 0
South London	1	8½	8½	27/6	—	5 2 8
Urban Ordinary	1	7	7	35/-	—	... ...
Westminster Ordinary	1	8½	8½	27/-	—	5 3 8
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	24/-	+3d.	6 5 0
Yorkshire Elec.	1	8	8	38/-	—	4 5 4
Home Rails.						
Central London Ord. Assented ...	Stock	4	4	78	+1	5 9 7
Metropolitan	,,	3	3	66½	—	4 10 3
do. District	,,	3½	4	79	—	5 1 3
Underground Electric	£1	1½	5	26/-	—1/-	3 17 0
do. do. Income ...	Bonds	6	6	125	—3	4 16 0
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	102½xd	—	5 17 1
do. Def.	,,	1½	1½	24⅛	—	6 9 0
Automatic Telephone	1	10	10	43/9	—	4 9 0
Eastern Extension	10	10	10	25½xd	+½	*3 18 6
Eastern Tel. Ord.	Stock	10	10	257xd	—	*3 18 0
Globe Tel. and T. Ord.	10	10	10	25½	—	*3 18 6
do. do. Pref.	10	6	6	11	—	5 7 10
Great Northern Tel.	10	20	20	38	—	5 5 8
Indo-European	25	10	10	47½	—	*5 5 8
Marconi	10/-	5	*10½	9⅞	—⅛	... ...
Marconi-Marine	1	8½	12½	53/-xd	—1/-	5 9 1
Oriental Telephone Ord.	1	12	12	3xd	+3/-	*4 0 0
United R. Plate Tel.	5	8	8	9½	—	*4 6 6
Western Telegraph	10	10	10	25⅞	—⅛	3 18 9
Home and Foreign Trams, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅞	—	7 11 9
do. do. 2nd. Pref. ...	5	6	6	9½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	540	—	... ...
do. do. Pref. Ord.	,,	8	7½	125	—	6 0 0
Brazil Traction	100	6	7	62½	+1	2 16 0
Brit. Colombia Elec. Rly. Pcc. ...	Stock	5	5	97½	+1	5 2 7
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	10/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 8
Mexico Trams, 5% Bonds	—	5	5	78	—	6 8 2
Mexican Light Common	100	Nil	Nil	80½	—	... ...
do. 7% Pref.	100	Nil	7	81½	—	8 11 10
do. 1st Bonds	—	5	5	76½	—	6 10 9
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...
Manufacturing Companies.						
Babcock & Wilcox	1	13	15	71/3	—	*4 4 8
British Aluminium Ord.	1	10	10	2½	—1/8	*4 9 0
British Elec. Transformer Pref....	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅛	—	3 11 9
Brush Ord.	1	10	10	23/9	—	6 19 2
Callenders	1	15	15	4⅛	+1/8	3 10 10
do 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Pref Ord. ...	1	—	6	19/-	+6d.	6 6 4
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	3 4 0
do. 5% Deb.	Stock	5	5	89½	—	5 11 9
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Ord.	1	20	20	4⅛	+⅛	4 8 4
English Electric	1	Nil	Nil	7/6	+6d.	... ...
do. do. Pref	1	8	Nil	10/-	—	... ...
Gen. Elec. Pref.	1	6½	6½	25/-	—	5 4 0
do. Ord.	1	7½	10	41/6	—	4 16 5
Henley	1	25	25	5¼	—	4 5 0
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 0
India-Rubber	1	Nil	Nil	10/9	—	... ...
Johnson & Phillips	1	12½	10	9⅛	+⅛	4 17 1
Met.-Vickers Ord.	1	8	6	34/-	—	3 10 7
do. Pref.	2	8	8	2½	—	5 19 5
Siemens Ord.	1	7½	7½	1½	—	5 0 0
Telegraph Construction	12	10	10	24⅛	—	*4 18 6

*Dividends paid free of Income Tax.

†4% of which was tax free.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged and all subsequent proceedings will be taken.

1927.

15,744. "Dry cells." L. Mellersh-Jackson (C. R. Burgess Laboratories, Inc.) June 13th, 1927. (297,400.)

16,165. "Electric meters." British Thomson-Houston Co., Ltd., and W. H. Lawes. June 17th, 1927. (297,353.)

16,240. "Starting of motor converters." English Electric Co., Ltd., and J. C. Wilson. June 18th, 1927. (297,343.)

16,392. "Automatic or semi-automatic telephone systems." Standard Telephones and Cables, Ltd., J. H. E. Baker and A. J. Chanter. June 20th, 1927. (297,487.)

16,443. "Load-discriminating systems for controlling the closing of an electric circuit-breaker" A. Reyrolle & Co., Ltd., and W. A. A. Burgess. June 21st, 1927. (297,403.)

16,461. "Automatically reclosing circuit-breaker systems." A. Reyrolle and Co., Ltd., and W. A. A. Burgess. June 21st, 1927. (297,404.)

16,467. "Electric switchgear." A. Reyrolle & Co., Ltd., H. W. Clothier, and A. Allan. June 21st, 1927. (297,405.)

16,492. "Accumulators." E. Parville. June 21st, 1927. (297,406.)

16,505. "Talking motion-picture production." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 21st, 1927. (297,407.)

16,686. "Process of and apparatus for welding." W. E. Beatty (Bell Telephone Laboratories, Inc.). June 23rd, 1927 (297,493.)

16,725. "Electric protective systems." General Electric Co., Ltd., and W. Wilson. June 23rd, 1927. (297,494.)

16,726. "Thermionic discharge tubes." M-O Valve Co., Ltd., B. P. Dudding, and C. F. Proctor. June 23rd, 1927. (297,495.)

16,727. "Electric signalling apparatus." General Electric Co., Ltd., and R. Windram. June 23rd, 1927. (297,496.)

16,824. "Electric heating devices for use in electric furnaces, domestic heating appliances, and the like." W. Rosenhain and W. E. Prytherch. June 24th, 1927. (297,503.)

16,886. "Process and means for the manufacture of insulating separators for accumulator plates." Soc. Anon. des Accumulateurs Monoplaque. April 16th, 1927. (288,959.)

16,892. "Radio receiving arrangements." Standard Telephones & Cables Ltd., and W. L. McPherson. June 24th, 1927. (297,507.)

17,064. "Boxes or containers for secondary batteries." J. Stone & Co., Ltd., and H. Cordrey June 27th, 1927. (297,344.)

17,855. "Track brakes for rail vehicles." A. W. Maley and E. M. Taunton. July 5th, 1927. (297,516.)

17,892. "Telephone number indicator." J. Gaunt and L. E. Gaunt. July 6th, 1927. (297,517.)

17,970. "Automatic telephone systems." A. E. O'dell (Deutsche Telephonwerke und Kabelindustrie Akt. Ges.). July 6th, 1927. (297,518.)

18,021. "Unit comprising means of improving the efficiency of small rectifying devices." P. R. Coursey, H. Andrewes, and Dubilier Condenser Co. (1925), Ltd. July 7th, 1927. (297,520.)

18,053. "Terminal nuts." A. P. Welch. July 7th, 1927. (297,521.)

18,318. "Electric candle." Lumenex Corporation. July 15th, 1926. (274,460.)

18,394. "Tap-changers for electric transformers." H. Diggle and Metropolitan-Vickers Electrical Co., Ltd. July 11th, 1927. (297,529.)

18,539. "Transformers." S. G. S. Dicker (Naamloose Vennootschap Philips' Gloeilampenfabrieken) July 12th, 1927. (297,531.)

18,801. "Apparatus for playing an electrical clock-dial game of skill." H. Garner and W. Waight. July 15th, 1927. (297,536.)

19,162. "Sound-reproducing devices, such as loud-speakers." A. P. Welch. July 19th, 1927. (297,539.)

20,584. "Voltaic cells" R. Schuster January 5th, 1927. (283,142.)

23,101. "Electric lifts." J. Fothergill. September 2nd, 1927. (297,562.)

23,196. "Electrical condensers." S. Z. De Ferranti and Ferranti, Ltd. September 3rd, 1927 (297,563.)

25,361. "Apparatus for producing Röntgen rays." Siemens-Reiniger-Veifa Ges. für Medizinische Technik. December 8th, 1926. (282,009.)

25,788. "High-tension magneto-electric machine." M. M. Cardellino. September 29th, 1927. (Addition to 273,908.) (297,575.)

25,877. "Unilateral conductors for the rectification of alternating current." H. G. Andre. October 29th, 1926. (Addition to 224,871.) (279,810.)

1928.

308. "Electrical insulators." J. E. Pollak (Hermsorf-Schomburg-Isolatoren Ges.). January 4th, 1928. (Addition to 289,709.) (297,613.)

1,920. "Electric condensers." Elektrizitäts Akt. Ges. Hydrawerk. January 20th, 1927. (283,939.)

2,706. "Sound-reproducing devices." De Forest Phonofilms, Ltd. January 29th, 1927. (284,343.)

3,681. "Electric centrifuge for spinning artificial silk." Bergmann Elektricitäts-Werke Akt. Ges. February 8th, 1927. (285,011.)

4,544. "Sparking plugs." Soc. Française des Bougies Pognon M. Pognon et Cie. December 13th, 1927. (297,633.)

5,452. "Oil-break switch with resistance." Maschinenfabrik Oerlikon. March 2nd, 1927. (286,206.)

5,730. "Electric lamp specially applicable for automobile headlights." A. Tricoche. March 19th 1927. (287,440.)

5,732. "Electric individual spindle for very high speeds." Siemens-Schuckertwerke Akt. Ges. March 24th, 1927. (287,550.)

8,598. "Aerial circuit for the reception or direction-finding of electromagnetic waves." Nederlandsche Telegraaf Maatschappij Radio-Holland. March 21st, 1927. (287,491.)

10,176. "Cooling devices for electric discharge devices." British Thomson-Houston Co. Ltd. May 18th, 1927. (290,621.)

10,285. "Electrical tumbler switches." D. Grant. April 5th, 1928. (297,654.)

15,604. "Current collectors as used on tramway and railway vehicles." H. M. Dudgeon. May 29th, 1928. (297,663.)

16,819. "Electromagnetic locking devices for use on railways." Westinghouse Brake & Saxby Signal Co., Ltd. June 9th, 1927. (291,806.)

Trade Mark Applications.

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from October 10th:—

Draco (lettering and design). No. 493,894. Class 8. Apparatus and instruments for use in connection with radio-telegraphy and telephony, and television, and parts thereof, but not including electric cables.—Drury Radio Co., Ltd., 23, Water Street Liverpool.

Vir (lettering and design). No. 488,865. Class 13. Electric lamps (ordinary) and electric light fittings.—Naamlooze Vennootschap Vereenigde Industrieen Rotterdam. (British representatives: McKenna & Co., 31-34, Basinghall Street, E.C.2.)

Stoflex No. 494,840. Class 40. Boxes or containers made of ebonite, being parts of electric batteries.—J. Stone & Co., Ltd., Deptford, S.E.14.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Fish meal factory, for Mutual Fish Products Co., Ltd.

AXBRIDGE.—Housing scheme (24), for the R.D.C.; Ball and Pope, architects, 30, West Street, Weston-super-Mare.

BARNSLEY.—Printing works, Eastgate; *Barnsley Chronicle*, Ltd. 50 houses, Burton Grange; C. D. Potter & Sons. 52 houses, Burton Grange; Dunk & Sons. 48 houses, Burton Grange; borough engineer.

BEBINGTON.—Schools (£76,050), for Cheshire E.C.; J. Partington, Ltd.; builders, Manchester.

BEXLEY.—Bank, Market Place, Bexley Heath, for Martin's Bank, Ltd. Houses (82), for Cox Bros., Maidstone.

BLACKBURN.—Extension of Greenbank Gasworks (£53,000); gas engineer.

BLEDINGTON (Kingham, Oxford).—Electric light installation, parish church; Rev. Alfred James Rendle, M.A., vicar.

BRADFORD.—Elementary school, Eccleshill; Education Committee. 28 houses, Moore Avenue; F. Wray. Nurses' accommodation, St. Luke's Hospital; city architect. 'Bus garage, Ludham Street (£29,500); tramway manager and city architect.

BRISTOL.—50 houses, Whitehall Estate; city engineer.

BROMLEY (Kent).—Branch library for the T.C.; Harold Cliffe, borough engineer (returnable deposit of £2 2s.).

BURNHAM AND FARNHAM ROYAL.—Factories, for Slough Estates, Ltd.

BURSCOUGH.—Re-erection of saw mills for Thomas Bamber, Kendal.

CARLISLE.—Business premises, Long Sowerby, Newtown, and Raffles Building Estates, for the South-End Co-operative Society; S. W. B. Jack, architect, Lloyd's Bank Chambers.

CHALFONT ST. PETER.—Housing scheme (128), for Amersham R.D.C.; surveyor.

CHEADLE (Cheshire).—Extension of Council office; F. A. Browne, county architect, Newgate Street, Chester.

COLCHESTER.—School, Lexden (£18,000), for the Borough E.C.; E. H. Bultitude, clerk.

CORRINGHAM (Essex).—Development of Corringham Park Estate for houses; Ideal Construction and Building Estates, Ltd.

COULSDON AND PURLEY.—Municipal offices for the U.D.C.; Nicholls & Hughes, architects, 4, Raymond Buildings, London, W.C. Housing scheme (20), Sanderstead, for the U.D.C.; surveyor.

DARLINGTON.—Works extensions, including laboratory, offices, &c., West Auckland Road, for the Chemical and Insulating Co.

DOUGLAS (I.O.M.).—Promenade improvement (£75,000); borough engineer.

DUDLEY.—Additional 126 houses, Mousesweet Brook, for the T.C.; borough surveyor.

DUNDEE.—Masonic hall at Lochee; James Lowe & Co., civil engineers and architects, Commercial Street.

DUNGENESS.—Houses (100), Old Battery, for Newcomb, Wright & Co.

EDINBURGH.—Transformer house at Junction Mills, Leith, for Scottish Co-operative Wholesale Society, Ltd.; the manager.

GILLINGHAM (Kent).—Houses (37), for A. Jarvis. Houses (76), Alexander Avenue, for Greenhalgh & Charlson.

GLASGOW.—Hall and offices for trustees of H.L.I. Regimental Club, 10, Newton Terrace; the manager. Hall for Ancient Order of Hibernians; the secretary.

HALIFAX.—New Alexandra Hall, in Alexandra Street (public assembly hall, shops, &c.); secretary, Halifax Building Society.

HAMILTON.—Skin curing factory; Mr. Wm. Paterson, Bent Road, Hamilton.

HULL.—Elementary school, Maybury Road; Education Committee. 74 houses, Ings Road; G. T. Spruit & Son. Block of flats, New George Street area; H. Armstrong. Pumping machinery, Cottingham Waterworks (£35,000); Worthington-Simpson, Ltd.

KESWICK.—Block of seven shops, for J. B. Wivell; James Jennings, architect, Church Street, Ambleside.

KILMARNOCK.—Conversion of Townholm engine works into central depôt, for the Midland Motor Co., Glasgow.

LANARKSHIRE.—Pithead baths at Ferniegair Colliery (to cost £12,000); the manager.

LEEDS.—Estate development, Green Hill Lane, Wortley; T. Handley. Estate development, Spen Lane; J. R. Micklethwaite. Adaptation Elmet Hall as hospital; city architect. Shops, Guildford Street, for Corporation; G. W. Atkinson, architect. Mining department, University (£500,000); H. V. Lanchester, architect, London; William Airey & Son (Leeds), Ltd., builders.

LONDON (Hackney, E.).—Factory, Wilton Road; E. B. Holmes & Co., Ltd. Factory, Loddiges Road; E. B. Holmes & Co., Ltd. Maisonettes, Dudlington Road (£48,000); borough engineer.

(Walthamstow, E.).—Library, Higham Hill (£8,432), for the U.D.C.; surveyor.

(Lewisham, S.E.).—Factory extension, Conington Road; H. E. Kennard.

(Battersea, S.W.).—Housing scheme, St. John's College and grounds, Vicarage Road; borough engineer.

(Kensington, S.W.).—Additions Royal Geographical Society, Kensington Gore and Exhibition Road; Kennedy and Nightingale.

(Westminster, S.W.).—Alterations and additions 39, Park Lane, North Row and Norfolk Street; G. Thrale Jell. Reconstruction Army and Navy Stores, Howick Place; Sir Aston Webb & Son.

(Wimbledon, S.W.).—Flats, Haydons Road; Wimbledon Utility Society, Ltd. Factory buildings, off Acuba Road; E. Hill Adams & Co., Ltd.

(Charing Cross, W.C.).—Buildings, 38-41, Charing Cross; Wimperis, Simpson & Guthrie.

(Strand, W.C.).—Rebuilding Strand and Bedford Street premises; Civil Service Supply Association.

LUTON.—Poor Law Institution, for the B.G.; clerk.

MANSFIELD.—Cripples' hospital, Nottingham Road (£19,000); A. N. Bromley, architect.

NORTHAMPTON.—Maternity block, General Hospital; governors.

OXFORD.—Extensions motor works, Woodstock Road; Morris Motors, Ltd. Waterworks, Sir Alex. Binnie, Son and Deacon.

PLYMOUTH.—Baths concert hall, &c., West Hoe; borough engineer. Education offices; Thorneley & Rooke, architects. Aerodrome, Port Development Committee. Extensions South Devon and East Cornwall Hospital; governors.

POOLE.—Extensions to Grammar School, for the Borough E.C.; director of education.

ST. ALBANS.—Additional 59 houses, for the T.C.; city surveyor.

SOUTH BENFLEET (Essex).—Cinema studio, for the Carter-Boston Film Producing Co.

SOUTHPORT.—Café and business premises, Kingsway, for the Opera House and Winter Gardens Co., Ltd.

STOCKPORT.—Telephone exchange, Woodley, for H.M. Office of Works, King Charles Street, London, S.W. (returnable deposit of £1 1s.).

STOCKTON-ON-TEES.—Houses (178), for the T.C.; H. M. Nowell, builder. Showrooms and workshop, Durham Road, for W. Edwards.

STOKE-ON-TRENT.—Tuberculosis hospital (£100,000); maternity home extensions (£10,000); children's hospital (£25,000); extensions, Stanfield Sanatorium (£12,500), for the T.C.; town clerk. Proposed aerodrome; Corporation and Air Ministry.

TAUNTON.—Labour hall, Priory Estate; Stone & Francis, architects, Lloyd's Bank Chambers, Fore Street.

THURNSCOE (Yorks.).—Town hall and municipal offices (£15,500), for the U.D.C.; surveyor.

WISHAW.—Housing scheme (84), Overtown, for Lanarkshire C.C.; P. C. Smith, District Offices, Hamilton.

WORCESTER.—Housing schemes (182) (£65,060); city surveyor.

YORK.—Erection of two senior departments of the Tang Hall Council School (deposit £2 2s.); F. T. Renty, architect, Yorkshire Penny Bank Chambers, Coney Street; tenders to G. H. Gray, secretary, Education Committee. (November 12th.)